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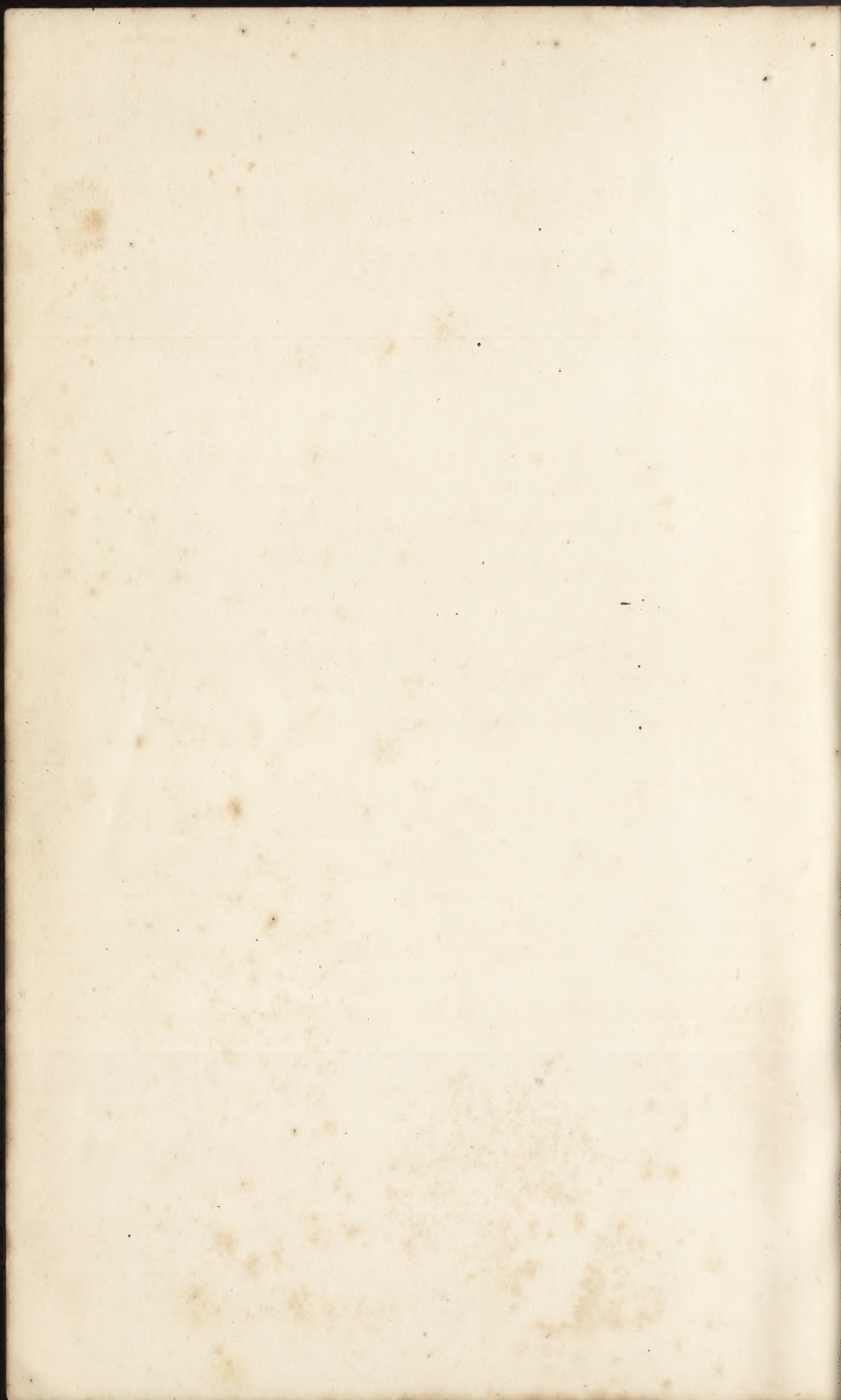
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PRACTICAL PRINTING

A HANDBOOK OF

THE ART OF TYPOGRAPHY

THE ORIGINAL WORK AND TWO FOLLOWING EDITIONS

By JOHN SOUTHWARD

THE FIFTH EDITION

(EMBRACING THE WORK ON COLOUR PRINTING BY F. NOBLE)

By ARTHUR POWELL

ASSISTED BY THE EXPERTS NAMED IN THE PREFACE

IN TWO VOLUMES

VOL. I.

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PREFACE.

It is hoped that this, the fifth, edition of *Practical Printing* will be found in every way superior to any of its predecessors, for time and trouble have not been spared to make it so. In some respects it has been rearranged, parts of it having been entirely rewritten, and much new matter has been added, the object being not only to supply deficiencies found to exist, but to acquaint the reader with all the newest methods.

In presenting it the Editor desires to acknowledge the invaluable assistance he has received. The subject of Job Work Composition has been dealt with by the practised hand of Mr. George Joyner, the author of *Fine Printing*, whose own work in that branch of the art has gained for him so many distinctions that he may be said to teach with authority. He has also given aid in various other parts of the treatise, and particularly in the choice of types on starting a printing office for job work. All copy for the section relating to Press and Machine Work has been carefully revised by Mr. Sydney Heron, overseer, lately to Messrs. Bradbury, Agnew & Co., Ltd., and now to Messrs. Wm. Clowes & Sons, Ltd., under whose care some of the finest examples of modern typographical work have been produced; while proofs of the whole of the first volume, and parts of the second, have been most assiduously read by Mr. W. H. Slater, the well-known

teacher of Typography at the Borough Polytechnic Institute, many of them having also passed under the scrutiny of Mr. W. Davies, his colleague at that Institute. The Editor owes many thanks to these gentlemen, and especially to Mr. Slater, who, though unable to comply with the request that he should assume the responsibility for the edition, has, nevertheless, made it a labour of love to point out blemishes and to suggest improvements.

Thanks also are given to Mr. W. Powrie, M.Inst.M.E., for kind permission to use the substance of his essay, as read before the Institution of Mechanical Engineers, on "Machinery for Book and General Printing" and its accompanying diagrams; to Mr. D. T. Powell for furnishing the matter relating to gas engines and the erection of a Wharfedale machine; to Mr. J. T. Cooper (Cooper & Budd, Ltd.) for the greater part of the chapter on Estimating; to Messrs. Harrild & Sons, Caslon & Co., Stephenson, Blake & Co., J. M. Powell & Son, Gould & Reeves, and various other machine makers, for the loan of woodcuts; and to the type-founders named in Chapter V. for the specimens there shown.

The late Mr. F. Noble's treatise on "Colour Printing" having long been out of print, the Editor determined to incorporate it as finally revised by that gentleman, yet with a few variations in arrangement, into the present work, the value of which it materially enhances.

The whole of the work has been read for press by Mr. W. L. Field.

LONDON, *July*, 1900.

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BOOK I.

INTRODUCTORY AND GENERAL.



PRACTICAL PRINTING.

CHAPTER I.¹

DEFINITION OF PRINTING.—Characteristics of Copperplate, Lithographic, and Letterpress Printing—Xylography and Typography—Relative Advantages of the Various Processes.

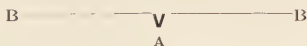
PRINTING² has been defined to be “the act, art, or practice of impressing letters, characters, or figures, on paper, cloth, or other material.” This is a wide definition, for it would include coining, stamping, embossing, etc. In the broadest sense in which the word is conventionally used perhaps the following is more correct: “Printing is the art of producing impressions for literary or graphic purposes, and in which ink is employed.” The ink is applied to a suitable surface, and transferred by pressure, the transfer being called a “print” or an “impression.”

In this sense there are three distinct methods of printing, and they are distinguished, in the first place, by the nature of the *surface* from which the impression is taken.

¹ The beginner should read through this chapter to get a general idea of its contents, but he may defer studying it till he makes a second perusal of the work. See the general Note following the Prefaces.

² The word “print” comes from the old French *empreindre*, which in turn comes from the Latin *imprimere*, to press.

1. *Copperplate*¹ *Printing*.—In this the subject is printed from an engraving *below* the surface, as A :—



2. *Lithographic Printing*.—In this the subject is printed from a slight elevation formed *on* the surface, as c :—



3. *Letterpress*¹ *Printing*.—In this the subject is printed from a relief *above* the surface, as E :—



Mr. Ruskin aptly distinguishes between the first and last as printing from a depressed furrow and from the elevated ridge between two furrows.

There are several essential differences in the treatment of these surfaces in printing. And first as regards distribution of pressure.

(a) In the Copperplate process the plate is heated and ink is rolled over it until the depressed or incised lines have been filled. The face of the plate is then wiped clean, care being taken that the ink in the incised lines is not removed. A moistened sheet of paper is then laid on the plate, and an impression taken by subjecting it to the pressure of the cylinder of a rolling press, whereby the paper is forced, to some extent, into the sunken lines, the ink whereof sticks to the paper.

Here B, the smooth face of the plate, makes no mark on the paper, but receives the full force of impression.

¹ We adopt these terms on account of the distinct meaning popularly attached to them, although they do not precisely describe the surfaces referred to. The Copperplate surface answers to that of an *intaglio* ; the Letterpress to that of a *cameo*.

(b) In the Lithographic process the design to be printed is formed by a greasy ink upon the smooth surface of a stone of peculiar fineness and firmness. The lines cling to and dry upon the surface of the stone, which is then subjected to the action of a weak acid, which hardens the ink, while it slightly etches and lowers the surface where it is unprotected. The stone is then damped, the water being absorbed by the unprotected face of the stone. The inking roller is then applied to the stone, with a contrary result, for the moistened surface repels the greasy ink, but the lines attract and retain it. When pressure is applied the ink of these lines is transferred to the surface printed. Hence, *d*, the surface of the stone, receives the full force of impression in every part.

(c) In Letterpress printing the elevated line *e* alone receives the ink, which is applied by a roller, and alone is subjected to the impression, the shoulder of the type or the field of the block *f* receiving neither ink nor impression.

There are marked differences in the *substances* used as surfaces in the three processes respectively.

(a) Copperplate printing is done with plates of copper, steel, or other metal which can be cleanly incised.

(b) Lithographic printing is done with stones, zinc plates, etc.

(c) Letterpress printing is done with types, blocks of wood, casts in metal, indiarubber, or celluloid; electro-types, etc.

There is, too, at present at least, a great distinction between these methods in the rapidity with which impressions are taken respectively.

(a) The average productiveness of a copperplate press is about 300 impressions per day, owing to the manipulation required.¹

¹For common work, however, a machine is sometimes used, whereby most of the processes are rendered automatic, and the speed is greatly increased.

(b) The usual performance of a lithographic hand press is about 500 copies per day; of a machine about 5,000 per day.

(c) A letterpress machine will give 1,000 to 2,000 or more impressions per hour, while fast newspaper machines give from 10,000 to 15,000 per hour.

There are two distinct kinds of letterpress printing:

1. The Xylographic;¹ 2. The Typographic.

In the Xylographic method, which was the primitive manner of printing, the design was usually engraved on blocks of wood.² The engraving was the reverse of the print to be taken, and done in relief, as already described. The pigment was applied to the surface of the design, and then, by pressure of some kind, was transferred to the material on which the print was to be produced. When a second copy was required it was, of course, not necessary to engrave the design again, but merely to repeat the inking of the block and again to press it upon the paper; when another print was obtained. Books thus printed are called block books, because each page generally consisted of a single engraved block.

Typography is an improvement upon this method. Instead of engraving one entire page of characters, and then another page, and so on, separate characters are engraved once only, and moulds being formed therefrom, *types* are cast,³ representing separate letters. The economy of this expedient is obvious.

The principle of the xylographic system is seen in the printing of wall-papers and floor-cloths and in the stereotype printing of books and newspapers. In stereotype

¹ This term is not used in the printing office, being rather a bibliographer's expression, but it may be adopted here to express all kinds of letterpress printing, except that done with movable type.

² Hence the name Xylog'raphy, from the Greek ξυλόν, *wood*, and γραφή, *writing*.

³ Typog'raphy is from the Greek τυπος, *type*, and γραφή, *writing*.

printing plates (being casts from types, however) are made for separate pages, and are no use for the printing of other combinations of words. Wood engravings (and electrotypes from them) are printed by the letterpress process, but strictly speaking do not form part of the art of typography, although it is convenient to say that they belong to letterpress printing.

Amongst the advantages of typography beyond those already mentioned, *viz.*, the economy of pressure, the consequent speed with which impressions can be produced, and the interchangeability of the characters, are:—

1. A given area of type metal usually costs less by weight than copper or steel, or (generally) the best qualities of lithographic stone, and less by measurement than the boxwood used by engravers.

2. The composition of a page like this would cost less than 5s., but the expense of engraving it by any process would be more than four times as much.

3. The engraved letters would not be so uniform, nor so legible, and they could only be used, as already pointed out, for the page for which they were made.

4. Printing types can be inked with greater ease than any other kind of surface, as already indicated. The typographic process is therefore better suited to receive the aid of labour-saving machinery. This has been shown by the marvellous development of this kind of machinery during the last half-century.

5. Surfaces of printing type can be multiplied almost infinitely by the aid of casting (stereotyping) and other processes, so that there is practically no limit to the productiveness of the press. It is now possible to print half a million copies of an extremely large newspaper within the space of three or four hours. No other process than typography has been found possible for the production of such enormous editions.

6. While copperplate printing is limited in its speed by the number of operations involved in each act of taking an impression, lithography is limited by the chemical, hygrometrical, and other processes which retard it. In the manufacture of books and newspapers typography is altogether unrivalled. When people speak of "The Art of Printing" they generally mean the Art of Letterpress Printing. It is this art with which we have to deal in the present work.¹

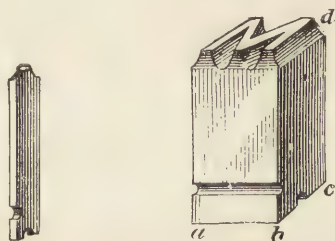
¹ The principal definitions and analyses in this introductory chapter are based on De Vinne's *Invention of Printing* and Dr. Hessels's *Koster Legend*.

CHAPTER II.

THE LETTERPRESS PRINTER'S PLANT AND MATERIALS, AND THEIR USES.

The Four Essentials.—The four things essentially necessary for printing are (1) something to print with, (2) something to print upon, (3) something to give the impression, and (4) something wherewith to record the impression. In letterpress printing these four essentials are generally represented by (1) *types*, (2) *paper*, (3) *a press*, and (4) *ink*.

Types.—A type is a piece of metal or wood, generally rectangular, and having cast or cut in relief on one (the top) of its six sides the distinctive design it is to impress. Types for books and newspapers are invariably cast in metal; only the large types used for placards are cut, and for these wood of a fine grain, such as box-wood or pear-wood, is nearly



always used. Types vary much in depth and width, but the height of all types, whether they be the small ones for the prayer book or the large ones for the placard, is uniform, whatever their other dimensions may be. This height is somewhat less than an inch. In the annexed illustration of a type the distance $c d$ is the height, $a b$ is the width, and $b c$ is the depth or "body;" the difference between "width"

and "depth" or "body" should be learnt, and kept well in mind. The depth or body of a type is said to measure an "em," and half the depth or body is called an "en."

The character which each type is intended to impress is called the "face" of the type.

The face does not occupy the whole of the top of the type; there is almost always a little space left unoccupied all round it. The object of this is to allow for a little white space between two printed characters placed side by side, and between any two lines of type immediately following one another.

In typography each type bears on its face *one* and generally only one character; in other words, every letter, point, and sign is a distinct type, and words and sentences are formed by placing the appropriate types together side by side in a line.

Spaces.—The reader will notice that in every book there are white spaces between the words. These are provided for by placing after the type which prints the last letter of each word one or more pieces of metal called "spaces."

Spaces are shaped just like types, save that they are not quite so high and that they have no "faces;" therefore, if properly placed, they never give any impression—their only object is to keep types apart which would otherwise lie together.

Spaces have always the same depth as the types with which they are used. They vary in width, and each width has its name—"thick," "thin," "middle," or "hair"—as will be seen hereafter.



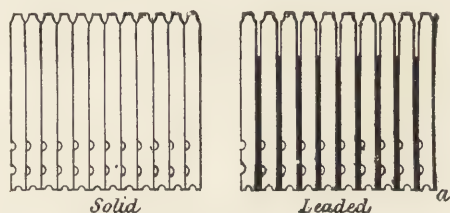
TYPES FORMING WORDS WITH SPACES BETWEEN.

Quads.—The wider spaces are called “quadrats” or “quads.”

Quads are generally used for the purpose of producing the white spaces which usually occur at the ends of sentences and paragraphs, but they may be (and are) used also for producing other white spaces. Quads are always of the same depth as the types and spaces with which they are used, but they are of various widths.

Quotations.—Sometimes a chapter ends six or seven lines from the top of a page, and all the rest of the page is left white. To produce such a white space by filling up with quads would involve too much labour, so larger pieces of metal, hollow, and wider and deeper than quads, are cast. These are called “quotations” and “French furniture.” The height of them is about the same as that of quads and spaces.

Leads.—Now look at any ordinary newspaper. Most of the lines in it are close together; others, which relate the more important news, or which constitute what are called the leading articles, are more widely separated. This wider



SIDE VIEW OF LINES OF TYPE.

separation is procured by inserting between the lines thin strips of metal. These strips are called “leads,” because the metal used is an alloy of lead.¹ Their height is about

¹ In some printing offices—especially newspaper offices—brass is used instead of lead, because it is more durable.

that of spaces or quads, their length varies with that of the lines of type between which they are placed. Leads are of three or more different thicknesses, and the printer chooses them of the thickness which he thinks most convenient for his purpose. The thicker the lead, the greater the white space between the printed lines. Lines of type with leads between them are said to be "leaded;" those without leads are said to be "solid."

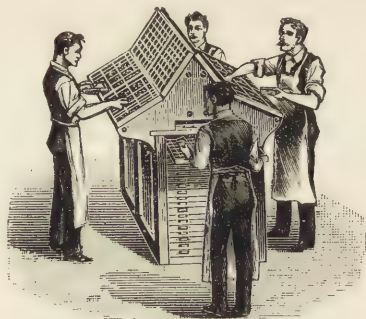
Clumps.—Very thick leads are called "clumps." They are sometimes nearly a quarter of an inch thick. Clumps are generally put at the top and bottom of columns or pages of type.

Reglet.—When the pages are wide and much space is wanted between the lines, as is sometimes the case in circulars and advertisements, thin strips of wood may take the place of leads. These strips are called "reglet."

Rules.—Turn now to the advertisements in the newspaper; each is separated from the other by a line. That line is produced by a strip of brass, called "brass rule." There are several different thicknesses of brass rule, but all have the same height—the height of types. The division of the newspaper into columns is also made by brass rules (called "column rules"), and the line across the head of each page is made by another brass rule (called a "head rule"). In the last illustration the black line marked *a* represents a brass rule.

Cases.—As there are so many different letters of the alphabet, points, and other characters, to say nothing of the different spaces and quads, it is necessary to keep types appropriate to each letter or character separate, and at the same time have them ready to the hand of the compositor when he wishes to use them. This is done by placing them in wooden trays called "cases." Strips of wood divide these trays into compartments, and each compartment is called a "box." Each "box" contains its own character,

and, whatever may be the kind of type used, that character is always placed in the box occupying the same relative



COMPOSITORS AT WORK.

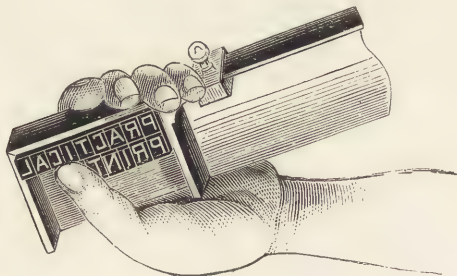
position in the case. It will be seen from the engraving that some of the "boxes" are larger than others; that is because some letters (such as *e* and *t*) occur in words much more frequently than others. The largest box is for the *e*'s.

Frames.—For the compositor to pick the types out of the boxes the cases must be placed handy for him. For this purpose they are put on "frames," which are wooden structures about four feet high. The cases are placed in a sloping position, and the compositor stands in front of them.

Composing-sticks.—The types, when they are picked out of the boxes, must be placed in proper order. To enable this to be done, the compositor holds in his left hand a small tray of metal or wood, called a "composing-stick." One side of this is generally adjustable, and by adjusting it the tray is made as wide as the page of print is intended to be, so that a full line in the tray is equal to a full line in the page of the intended book. A composing-stick is for brevity often called "a stick."

Setting-rule.—A piece of brass or steel rule, the length of a line, with an overhanging ear, is used by the compositor to facilitate the placing of the types in order in the stick. This is called a “setting-rule.”

Galleys.—A composing-stick is necessarily small, otherwise it would be unhandy; it will hold but a few lines of type. What is to be done when it is full? Lay it aside and take another? This would lead to great confusion, so a better plan is adopted. The types composed, or “set,”¹ in the stick are lifted out and carefully placed in a much larger tray called a “galley,” and this is made to lie in some convenient place. Galleys are of different shapes and sizes, according to the nature of the work to be done.



COMPOSING-STICK.

Imposing Surface.—As stickful after stickful of composed type or “matter”² is added to the galley, the latter gets full, and galley succeeds galley in due rotation. The “matter” has then to be divided into portions and made up into “pages.” These portions or “pages” are slid from the galleys and placed on a table, called an “imposing surface”

¹ To “set” and to “compose” type are synonymous terms,

² Composed type is called “matter.”

or "stone."¹ The proper placing of the pages is called "imposing."

Page Cord.—To prevent the types constituting a page from falling about and becoming a confused mass,² a clump or some leads are placed at the head and foot of the page, and the whole is then tied round firmly with strong twine made specially for the purpose and called "page cord." A page thus tied may be slid from a galley and moved about the stone by a skilful compositor without fear of the types constituting it getting out of order.

Chases.—The types having been thus composed, formed into pages, and imposed or placed in due order, to keep them firmly fixed in their places, and to enable them to be moved about, they are enclosed in a strong iron frame called a "chase."

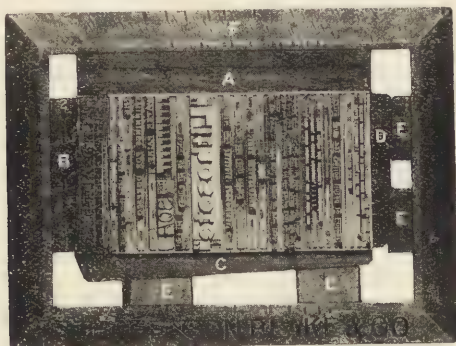
Furniture.—To fill up spaces in the chase unoccupied by the page or pages of type, pieces of metal or wood called "furniture" are inserted. These are rectangular in shape, of a height not quite equal to that of spaces, and of various widths and lengths. When there are two or more pages in a chase, they are usually separated by a piece or pieces of furniture. Small pieces of furniture will also perform the same kind of duty as quotations where the space to be filled up is large. On the other hand, reglet is often used to assist in the work done by furniture.

Side and Foot Sticks and Quoins.—The space inside the chase having been almost filled up by the page (or pages) of type and the furniture, the whole has to be fixed into the chase; for this purpose long wedges (or rather inclined planes) are placed at the sides and feet of the pages, or of

¹ Imposing surfaces are sometimes called "stones," because the tops of the tables used to be formed of smooth stone; they are now generally made of planed iron.

² Such a confused mass is called by printers "pie."

the furniture enclosing them, and short wedges are driven in between the rim of the chase and the long wedges. In this way the whole is firmly held together, and the chase and its



A FORME.

A and B, Furniture ; C, Sidestick ; D, Footstick ; EE, Quoins ; F, Chase.

contents may be carried from place to place. The long wedges, or inclined planes, are called "sidesticks" and "footsticks," and the short wedges are called "quoins."

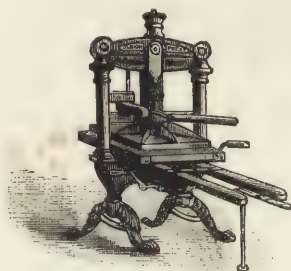
Shooting-sticks and Mallets.—In order to drive the quoins in tight, considerable force has to be used. The quoins are first placed in position with the finger and thumb, and then a piece of wood, horn, or metal, called a "shooting-stick," is placed against them, and this is struck with a wooden mallet. This operation is termed "locking-up," and a page or pages of type locked up in a chase constitute a "forme."

Planers.—To make sure that the types in a chase shall all be level, or, in other words, that none of them shall be standing up higher than others, there is passed over the pages while they are on the imposing surface a moderately

thick piece of hard wood, planed perfectly smooth and called a "planer," and this is from time to time tapped with the mallet. Thus any types sticking up are driven down to their proper positions. This is of course done before the forme is finally locked up.

Bodkins.—Very often words are mis-spelt by the compositor, or a wrong type gets in by accident; then the wrong type has to be removed from the line, and the proper one substituted. To make the necessary removal the compositor uses a small steel spike, fixed in a handle. This is called a "bodkin."

Presses.—There are two kinds of presses, (a) hand presses and (b) mechanical presses. The latter are, in England, usually called "machines" or "printing machines." In the first kind the type in its chase, technically called the "forme," lies on a table of iron, called the "bed" of the press, ink is applied to the type, paper is laid on it, and then the whole is by mechanical means conveyed under a flat piece of iron

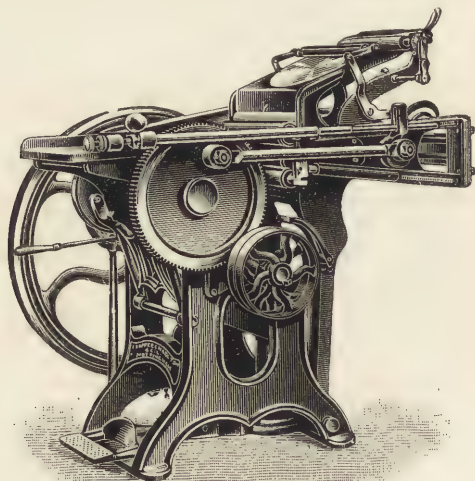


HAND PRESS.

called a "platen," whose under surface is parallel with the surface of the bed. Then the pressman pulls a lever, and the platen is made to descend and squeeze the paper on to the types. On letting go the lever the platen rises, and upon the bed being brought out again it is found that that side of the paper which was next the forme has received an

impression from the types, the impression being permanently recorded by the ink which now adheres to the paper.

There are of course various accessories which are most useful, and indeed necessary in practice, but which need not here be mentioned. We will, however, state that as

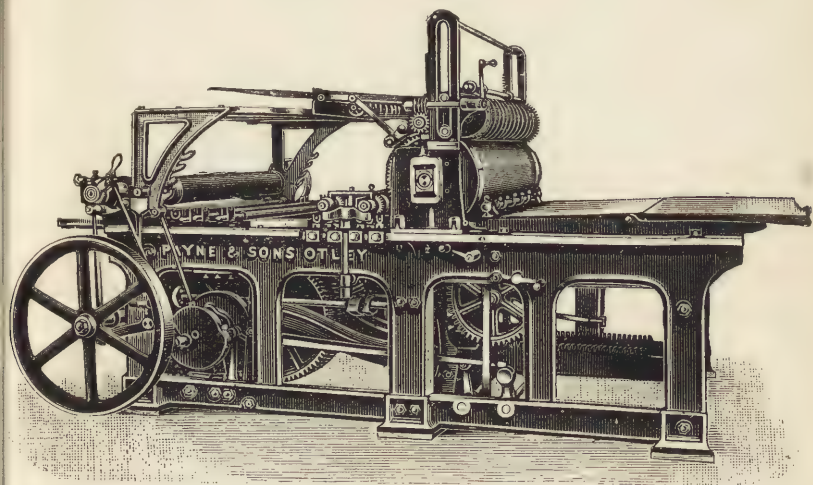


TREADLE PLATEN MACHINE.

the iron platen is hard and unyielding, it is necessary that there should be interposed between it and the sheet of paper to be printed on either a piece of blanket or several sheets of paper.

Mechanical presses are of two kinds : (*a*) those in which the impression is given by a platen, as in the hand press, and (*b*) those in which a cylinder is substituted for the platen. In either kind the impression is given, not by levers operated by the arm of the pressman as in the hand press, but indirectly, by the setting in motion, by treadle, hand, or steam power, of a flywheel, whose revolutions, communicated by gearing, cause in the one case the platen to

advance to and recede from the bed, and in the other the bed to pass under the cylinder, which at the same time revolves. Two different principles of impression are here represented. In the case of a platen impression the whole



CYLINDER MACHINE.

surface of the forme is printed at once; while that of a cylinder is imparted gradually, each part of the forme being printed successively as contact is made in the rotary action of the cylinder.

Ink.—Printing ink is very different from writing ink; it is thick and viscous, and has to be spread or “distributed” on a level table of iron, stone, or wood, or, in some machines, on iron cylinders or “distributing drums,” and then a film of it is thence transferred to the faces of the types.

Rollers.—It is found that the best way of distributing the ink and applying it to the types is to use “rollers.” These are spindles or cylinders of iron or wood, covered with a composition of treacle and glue or other substances. Each

roller revolves on its axis, and the way it operates is that it is passed up and down over the ink table and then over the type. The means adopted for obtaining an even supply of ink cannot be detailed here, but will be dealt with fully later on.

Ink Tables.—When used with hand presses, the ink tables stand apart, and the distributing and imparting of the ink are generally the work of one man, while another lays on the sheets of paper and takes the impressions by pulling the lever and otherwise operating the press. In “machines,” however, the ink table or drum always adjoins the type bed, and the rollers are passed over it and on to the types mechanically, without the intervention of hand labour.

The art of printing is divided into two main branches, called composition and press work. All the preliminary work, down to and including the making up of the formes, is performed in the “composing room” by workmen called “compositors;” the actual operation of printing the sheets is performed in another part of the printing office called the “press room” or “machine room,” by workmen called “pressmen” or “machine managers.” When as many impressions as are wanted have been taken from the forme it is returned to the composing room, and, unless it is to be kept as it is (in which case it is put in a rack and is said to be “kept standing”), it is put on the imposing surface, unlocked (*i.e.*, the quoins loosened with the mallet and shooting-stick), and all its component parts returned to their proper places, the types themselves being placed one by one each in its own box in the case ready for another job. This operation is called “distributing.”

CHAPTER III.

PAPER: ITS SIZES AND SUB-DIVISIONS.—Sheets, Quires, and Reams
—a Broadside—the Regular Folds—the Irregular Folds.

THE reader, having become acquainted with the operations of the printer as given in outline in the last chapter, should now turn to the subject of Paper, its sizes and sub-divisions. It is proper that this topic should be considered before that of the appliances and plant of the compositor, because some of these are designated by the sizes and divisions of paper, and their names cannot properly be understood until those are explained.

Paper is now for the most part made by machines in a continuous web, and for newspaper purposes is delivered in rolls of great size. For nearly all other purposes, however, it is divided into rectangular pieces or "sheets" of various sizes, and each standard size has its own name. It may be as small as a piece of note paper, or of enormous dimensions fit for a poster ; but whatever its size it is a *sheet*.

Papers are called Printing Papers, Writing Papers, Drawing Papers, etc., according to the purpose for which they are primarily intended. They are made up into parcels called "reams," each ream consisting of a certain number of sheets. A ream of writing paper consists of 480 sheets or 20 "quires" of 24 sheets each. Some Printing Papers are made up into reams of 480 sheets, and some into reams of 500 sheets ; but the majority are in reams of 516 sheets, and such are called "perfect reams." In every case 24 sheets go to the "quire,"

In reams of Printing Papers the sheets are almost always unfolded, or *flat* as they are called. Such an unfolded sheet, of whatever dimensions, is called a *broadside*.

A broadside folded once down the middle so as to make 2 equal leaves or 4 pages is properly called "a sheet *in folio*;"¹ a page of a sheet in folio is obviously one-half the size of the broadside.

A sheet in folio folded again down its middle is a sheet *in quarto* (4to), and is so called because a page of a sheet so folded is one-fourth the size of the broadside: it consists of 4 leaves or 8 pages.

A sheet in quarto folded again down its middle is a sheet *in octavo* (8vo), and is so called because the page of a sheet so folded is one-eighth the size of the broadside: it consists of 8 leaves or 16 pages.

A sheet of octavo folded again down the middle is a sheet *in sextodecimo* (16mo), or a sheet in "sixteens:" it consists of 16 leaves or 32 pages.

By giving one fold more we get the sheet in 32mo or 32's, with 32 leaves or 64 pages, and by giving it yet another fold we get it in 64's, with 64 leaves or 128 pages, and so on.

If we fold the broadside into three equal parts we get the sheet "in thirds," with 3 leaves or 6 pages; if, being so folded, we fold it once again down the middle we get it *in sexto* (6to) or in "sixes," with 6 leaves or 12 pages; if we then give it another fold down its middle we get it *in duodecimo* (12mo) or in "twelves," with 12 leaves or 24 pages; and proceeding in like manner we get, with one more fold, the sheet in 24's (48 pages), and with still another the sheet in 48's (96 pages).

What has been stated holds good whatever the shape and dimensions of the sheet.

Sheets of standard sizes are invariably oblong; that is, longer one way than the other, and as a rule conventionality

¹Folio, quarto, octavo, etc., are Latin words. Folio is from *folium*, a leaf. Quarto means "in one fourth," octavo "in one eighth."

requires that a page of a newspaper or book should measure more in length (*i.e.*, from top to bottom) than in width ; therefore for ordinary purposes whenever a sheet, whether in broadside, in folio, in quarto, in octavo, or any other size, has to be folded, the first fold is made across its *longer* side, and then the sheet so folded is turned round so that that which was the shorter, but is now the longer side, runs from top to bottom.

Get or cut a piece of paper measuring 15 inches one way and 20 inches the other (this is a sheet of the standard size called "crown"); fold it down the middle of the longer sides and you get 2 leaves or 4 pages each measuring 10 inches by 15 inches; and now, in order that the leaves may open in the ordinary way, you have to turn the sheet about so that what was the top of the broadside now becomes one of the sides of the folio; fold it again down the middle of the longer side of the folio (*i.e.*, down the side measuring 15 inches) and you get the sheet *in quarto* or 4 leaves or 8 pages each measuring $7\frac{1}{2}$ inches by 10 inches; again it has to be turned about to get it the right way up, and this process continues however many may be the folds. Observe the dimensions and their relation to one another :—

The Crown broadside measures	-	-	15	×	20	inches
The Crown sheet in folio	„	-	10	×	15	„
„ in quarto	„	-	$7\frac{1}{2}$	×	10	„
„ in octavo	„	-	5	×	$7\frac{1}{2}$	„

The mode of folding and turning above described gives what are known as the "ordinary," "common," or "broad" sub-divisions of a sheet, and the sizes given above are those of the ordinary, common, or broad folio, quarto, and octavo of the sheet selected; and whenever we speak simply of "folio," "quarto," "octavo," etc., we mean this ordinary, common, or broad folio, quarto, octavo, etc., though, as will

be seen, there is at least one other size of each kind. As has already been stated, in the common folding it is always the longer side for the time being which is halved, and this is apparent from the above figures.

The following diagram will illustrate what has been said, and will show the relative sizes of the broadside and its common sub-divisions:—

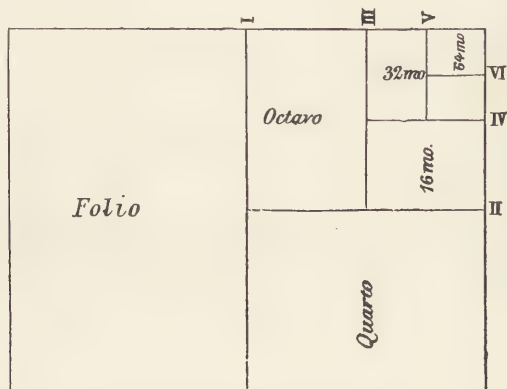


FIG. 1.—THE ORDINARY FOLDS.

Take another sheet of this crown-size paper, and instead of folding the broadside down the middle of its long side fold it down the middle of its *short* side; you get the sheet still in folio with 2 leaves or 4 pages, but these are different in shape from the ordinary folio pages: they are called "long folio;" if without turning the sheet as you did in the previous instance you go on folding it again in half you get "long-slip quarto;" and if you fold the long-slip quarto down the middle of its shorter sides you get "long-slip octavo;" but if, having got long-slip quarto, instead of going on to the long-slip octavo you turn the paper about and make your third fold in the middle of the *long* sides of the long-slip quarto you get "long octavo." We could

also get "long octavos" out of the first sheet we took by folding common or broad quarto down the middle of its shorter sides.

Take a third sheet of the paper, fold the broadside in the middle of its longer sides, so as to get ordinary folio, and then continue folding in half without turning; you then get "long quarto" and "short-slip octavo" thus:—

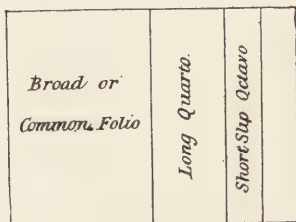


FIG. 2.

Thus we see that we may have two kinds of folio, three kinds of quarto, and four kinds of octavo, and so on; but the beginner need not at first trouble about any but those which have been described as the common or ordinary kinds.

The division of a sheet into folio, quarto, octavo, 16mo, 32mo, 64mo, etc., is called *regular* sub-division. *Irregular* sub-division is where the sheet is not folded right across each time; thus thirds, 6to, 12mo, 24mo, 48mo, etc., are irregular sub-divisions.¹

A sheet may be divided into these irregular sub-divisions in any of the following three ways: (1) The sheet may be first folded into three along its *long sides* so as to make thirds, and then the thirds may be folded as in Fig. 3: this mode gives the common thirds, sixes, twelves, twenty-fours, etc.; (2) the sheet may be folded into thirds along its *short sides*, and then may be folded across twice as in Fig. 4; and (3) it may be folded into two along its short sides, and then

¹ The beginner need not stop to master the next paragraphs.

transversely folded first into three and afterwards in half again as in Fig. 5.

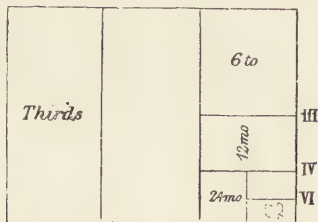


FIG. 3.—COMMON THIRDS.

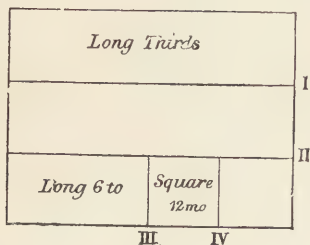


FIG. 4.

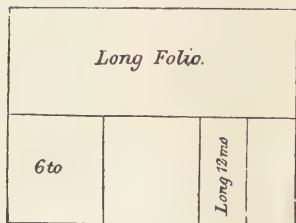


FIG. 5.

If having folded into thirds we fold again down the middle of the then shorter sides we get another and seldom used kind of 6to, and if we cross-fold that 6to into three we get 18mo.

There being these different ways of folding we can get two kinds of thirds (common thirds and long thirds), two kinds of 6to (common and long), two kinds of 24mo and 18mo, and three kinds of 12mo (common, long, and square).

The following diagrams show at a glance the different kinds of folio, quarto, octavo, and 12mo. Each represents a sheet of paper which has been folded and opened out flat again. The inner lines show the folds, and each undivided white space represents the sub-division named at the foot of the diagram:—



FIG. 6.—BROAD FOLIO.

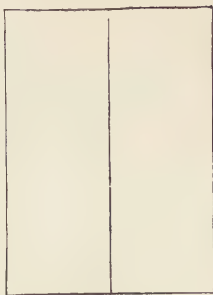


FIG. 7.—LONG FOLIO.

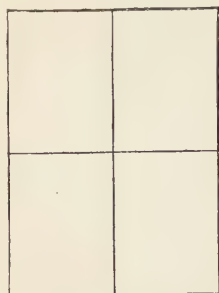


FIG. 8.—COMMON 4TO.



FIG. 9.—LONG 4TO.

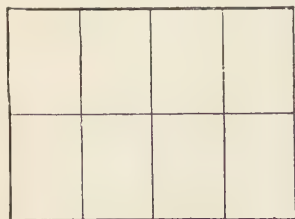


FIG. 10.—COMMON 8VO.



FIG. 11.—LONG 8VO.

SUB-DIVISIONS OF PAPER.

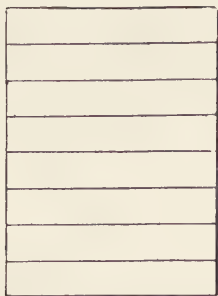


FIG. 12.—SHORT SLIP 8VO.

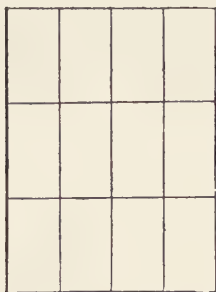


FIG. 13.—COMMON 12MO.

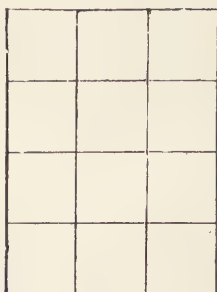


FIG. 14.—SQUARE 12MO.



FIG. 15.—LONG 12MO.

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A TABLE OF THE SIZES OF PAPER AND THEIR SUB-DIVISIONS,

CALCULATED TO THE NEAREST EIGHTH OF AN INCH.

	Broadside.	Long Folio.	Long Thirds.	Long Slip 8vo.	Broad Folio.	Broad Thirds.	Long 4to.	Short Slip 8vo.	Broad or Com. 4to.	Long 8vo.	Common 8vo.	16mo.	32mo.	Common 12mo.	Long 12mo.	Square 12mo.
DBL. SUPER ROYAL	$27\frac{1}{2} \times 41$	$13\frac{3}{4} \times 41$	$9\frac{1}{8} \times 41$	$3\frac{1}{2} \times 41$	$20\frac{1}{2} \times 27\frac{1}{2}$	$13\frac{3}{4} \times 27\frac{1}{2}$	$10\frac{1}{2} \times 27\frac{1}{2}$	$5\frac{1}{8} \times 27\frac{1}{2}$	$13\frac{3}{4} \times 20\frac{1}{2}$	$6\frac{1}{8} \times 20\frac{1}{2}$	$10\frac{1}{2} \times 13\frac{3}{4}$	$6\frac{1}{8} \times 10\frac{1}{2}$	$5\frac{1}{8} \times 6\frac{1}{8}$	$6\frac{1}{8} \times 13\frac{3}{4}$	$6\frac{1}{8} \times 13\frac{3}{4}$	$9\frac{1}{8} \times 10\frac{1}{2}$
DOUBLE ROYAL ..	25×40	$12\frac{1}{2} \times 40$	$8\frac{1}{4} \times 40$	$3\frac{1}{8} \times 40$	20×25	$13\frac{1}{2} \times 25$	10×25	5×25	$12\frac{1}{2} \times 20$	$6\frac{1}{4} \times 20$	$10 \times 12\frac{1}{2}$	$6\frac{1}{4} \times 10$	$5 \times 6\frac{1}{4}$	$6\frac{1}{4} \times 13\frac{1}{2}$	$6\frac{1}{4} \times 12\frac{1}{2}$	$8\frac{1}{2} \times 10$
DOUBLE DEMY ..	$22\frac{1}{2} \times 35$	$11\frac{1}{4} \times 35$	$7\frac{1}{2} \times 35$	$2\frac{3}{4} \times 35$	$17\frac{1}{2} \times 22\frac{1}{2}$	$11\frac{1}{8} \times 22\frac{1}{2}$	$8\frac{1}{4} \times 22\frac{1}{2}$	$4\frac{3}{8} \times 22\frac{1}{2}$	$11\frac{1}{4} \times 17\frac{1}{2}$	$5\frac{5}{8} \times 17\frac{1}{2}$	$8\frac{3}{4} \times 11\frac{1}{4}$	$5\frac{5}{8} \times 8\frac{3}{4}$	$4\frac{3}{8} \times 5\frac{5}{8}$	$5\frac{1}{2} \times 11\frac{1}{4}$	$5\frac{1}{2} \times 11\frac{1}{4}$	$7\frac{1}{2} \times 8\frac{3}{4}$
DBL. LARGE POST ..	21×33	$10\frac{1}{2} \times 33$	7×33	$2\frac{5}{8} \times 33$	$16\frac{1}{2} \times 21$	11×21	$8\frac{1}{2} \times 21$	$4\frac{1}{4} \times 21$	$10\frac{1}{2} \times 16\frac{1}{2}$	$5\frac{1}{2} \times 16\frac{1}{2}$	$8\frac{1}{4} \times 10\frac{1}{2}$	$5\frac{1}{4} \times 8\frac{1}{4}$	$4\frac{1}{8} \times 5\frac{1}{4}$	$5\frac{1}{4} \times 11$	$5\frac{1}{4} \times 10\frac{1}{2}$	$7 \times 8\frac{1}{4}$
DOUBLE CROWN ..	20×30	10×30	$6\frac{5}{8} \times 30$	$2\frac{1}{2} \times 30$	15×20	10×20	$7\frac{1}{2} \times 20$	$3\frac{3}{4} \times 20$	10×15	5×15	$7\frac{1}{2} \times 10$	$5 \times 7\frac{1}{2}$	$3\frac{3}{4} \times 5$	5×10	5×10	$6\frac{5}{8} \times 7\frac{1}{2}$
DBL. SMALL POST ..	$19\frac{1}{2} \times 31\frac{1}{2}$	$9\frac{3}{4} \times 31\frac{1}{2}$	$6\frac{3}{8} \times 31\frac{1}{2}$	$2\frac{1}{4} \times 31\frac{1}{2}$	$15\frac{3}{4} \times 19\frac{1}{2}$	$10\frac{1}{2} \times 19\frac{1}{2}$	$7\frac{1}{8} \times 19\frac{1}{2}$	$4 \times 19\frac{1}{2}$	$9\frac{3}{4} \times 15\frac{3}{4}$	$4\frac{7}{8} \times 15\frac{3}{4}$	$7\frac{1}{8} \times 9\frac{3}{4}$	$5 \times 7\frac{1}{8}$	4×5	$4\frac{1}{2} \times 10\frac{1}{2}$	$5\frac{1}{4} \times 9\frac{3}{4}$	$6\frac{1}{4} \times 7\frac{1}{8}$
DOUBLE FOOLSCAP ..	17×27	$8\frac{1}{2} \times 27$	$5\frac{5}{8} \times 27$	$2\frac{1}{8} \times 27$	$13\frac{1}{2} \times 17$	9×17	$6\frac{1}{4} \times 17$	$3\frac{5}{8} \times 17$	$8\frac{1}{2} \times 13\frac{1}{2}$	$4\frac{1}{4} \times 13\frac{1}{2}$	$6\frac{3}{4} \times 8\frac{1}{2}$	$4\frac{1}{4} \times 6\frac{3}{4}$	$3\frac{5}{8} \times 4\frac{1}{4}$	$4\frac{1}{2} \times 9$	$4\frac{1}{2} \times 8\frac{1}{2}$	$5\frac{5}{8} \times 6\frac{3}{4}$
DOUBLE POTT ..	$15\frac{1}{2} \times 25$	$7\frac{3}{4} \times 25$	$5\frac{1}{4} \times 25$	2×25	$12\frac{1}{2} \times 15\frac{1}{2}$	$8\frac{1}{2} \times 15\frac{1}{2}$	$6\frac{1}{4} \times 15\frac{1}{2}$	$3\frac{5}{8} \times 15\frac{1}{2}$	$7\frac{3}{4} \times 12\frac{1}{2}$	$3\frac{1}{2} \times 12\frac{1}{2}$	$6\frac{1}{4} \times 7\frac{3}{4}$	$3\frac{1}{2} \times 6\frac{1}{4}$	$3\frac{5}{8} \times 3\frac{5}{8}$	$3\frac{1}{2} \times 8\frac{3}{4}$	$4\frac{1}{8} \times 7\frac{3}{4}$	$5\frac{1}{8} \times 6\frac{1}{4}$
IMPERIAL ..	22×30	11×30	$7\frac{1}{4} \times 30$	$2\frac{3}{4} \times 30$	15×22	10×22	$7\frac{1}{2} \times 22$	$3\frac{3}{4} \times 22$	11×15	$5\frac{1}{2} \times 15$	$7\frac{1}{2} \times 11$	$5\frac{1}{2} \times 7\frac{1}{2}$	$3\frac{3}{4} \times 5\frac{1}{2}$	$5\frac{1}{2} \times 10$	5×11	$7\frac{1}{8} \times 7\frac{1}{2}$
SUPER ROYAL ..	$20\frac{1}{2} \times 27\frac{1}{2}$	$10\frac{1}{4} \times 27\frac{1}{2}$	$6\frac{1}{4} \times 27\frac{1}{2}$	$2\frac{1}{4} \times 27\frac{1}{2}$	$13\frac{3}{4} \times 20\frac{1}{2}$	$9\frac{3}{8} \times 20\frac{1}{2}$	$6\frac{1}{4} \times 20\frac{1}{2}$	$3\frac{3}{8} \times 20\frac{1}{2}$	$10\frac{1}{4} \times 13\frac{3}{4}$	$5\frac{1}{8} \times 13\frac{3}{4}$	$6\frac{1}{4} \times 10\frac{1}{4}$	$5\frac{1}{8} \times 6\frac{1}{8}$	$3\frac{3}{4} \times 5\frac{1}{8}$	$5\frac{1}{8} \times 13\frac{3}{4}$	$4\frac{3}{4} \times 10\frac{1}{4}$	$6\frac{1}{8} \times 6\frac{1}{8}$
ROYAL ..	20×25	10×25	$6\frac{3}{8} \times 25$	$2\frac{1}{2} \times 25$	$12\frac{1}{2} \times 20$	$8\frac{3}{8} \times 20$	$6\frac{1}{4} \times 20$	$3\frac{1}{4} \times 20$	$10 \times 12\frac{1}{2}$	$5 \times 12\frac{1}{2}$	$6\frac{1}{4} \times 10$	$5 \times 6\frac{1}{4}$	$3\frac{1}{8} \times 5$	$5 \times 8\frac{3}{8}$	$4\frac{3}{8} \times 10$	$6\frac{3}{8} \times 6\frac{1}{4}$
MEDIUM ..	$18\frac{1}{2} \times 23\frac{1}{2}$	$9\frac{1}{4} \times 23\frac{1}{2}$	$6\frac{1}{8} \times 23\frac{1}{2}$	$2\frac{5}{8} \times 23\frac{1}{2}$	$11\frac{3}{4} \times 18\frac{1}{2}$	$8 \times 18\frac{1}{2}$	$5\frac{1}{4} \times 18\frac{1}{2}$	$3 \times 18\frac{1}{2}$	$9\frac{1}{2} \times 11\frac{3}{4}$	$4\frac{7}{8} \times 11\frac{3}{4}$	$5\frac{7}{8} \times 9\frac{1}{2}$	$4\frac{7}{8} \times 5\frac{7}{8}$	$3 \times 4\frac{7}{8}$	$4\frac{7}{8} \times 7\frac{1}{2}$	$3\frac{1}{2} \times 9\frac{1}{2}$	$6\frac{1}{8} \times 5\frac{7}{8}$
DEMY ..	$17\frac{1}{2} \times 22\frac{1}{2}$	$8\frac{3}{4} \times 22\frac{1}{2}$	$5\frac{5}{8} \times 22\frac{1}{2}$	$2\frac{1}{2} \times 22\frac{1}{2}$	$11\frac{1}{4} \times 17\frac{1}{2}$	$7\frac{1}{2} \times 17\frac{1}{2}$	$5\frac{5}{8} \times 17\frac{1}{2}$	$2\frac{3}{4} \times 17\frac{1}{2}$	$8\frac{3}{4} \times 11\frac{1}{4}$	$4\frac{3}{8} \times 11\frac{1}{4}$	$5\frac{5}{8} \times 8\frac{3}{4}$	$4\frac{3}{8} \times 5\frac{5}{8}$	$2\frac{1}{2} \times 4\frac{3}{8}$	$4\frac{3}{8} \times 7\frac{1}{2}$	$3\frac{3}{8} \times 8\frac{3}{4}$	$5\frac{1}{2} \times 5\frac{5}{8}$
LARGE POST ..	$16\frac{1}{2} \times 21$	$8\frac{1}{4} \times 21$	$5\frac{1}{8} \times 21$	2×21	$10\frac{1}{2} \times 16\frac{1}{2}$	$7 \times 16\frac{1}{2}$	$5\frac{1}{4} \times 16\frac{1}{2}$	$2\frac{5}{8} \times 16\frac{1}{2}$	$8\frac{1}{4} \times 10\frac{1}{2}$	$4\frac{1}{8} \times 10\frac{1}{2}$	$5\frac{1}{4} \times 8\frac{1}{4}$	$4\frac{1}{8} \times 5\frac{1}{4}$	$2\frac{5}{8} \times 4\frac{1}{8}$	$4\frac{1}{8} \times 7$	$3\frac{1}{2} \times 8\frac{1}{4}$	$5\frac{1}{2} \times 5\frac{1}{4}$
CROWN ..	15×20	$7\frac{1}{2} \times 20$	5×20	$1\frac{1}{2} \times 20$	10×15	$6\frac{5}{8} \times 15$	5×15	$2\frac{1}{2} \times 15$	$7\frac{1}{2} \times 10$	$3\frac{3}{4} \times 10$	$5 \times 7\frac{1}{2}$	$3\frac{3}{4} \times 5$	$2\frac{1}{2} \times 3\frac{3}{4}$	$3\frac{3}{4} \times 6\frac{5}{8}$	$3\frac{3}{4} \times 7\frac{1}{2}$	5×5
POST ..	$15\frac{3}{4} \times 19\frac{3}{4}$	$8 \times 19\frac{3}{4}$	$5\frac{1}{2} \times 19\frac{3}{4}$	$2 \times 19\frac{3}{4}$	$9\frac{3}{4} \times 15\frac{3}{4}$	$6\frac{1}{2} \times 15\frac{3}{4}$	$4\frac{7}{8} \times 15\frac{3}{4}$	$2\frac{3}{4} \times 15\frac{3}{4}$	$8 \times 9\frac{3}{4}$	$4 \times 9\frac{3}{4}$	$4\frac{7}{8} \times 8$	$4 \times 4\frac{7}{8}$	$2\frac{3}{8} \times 4$	$4 \times 6\frac{1}{2}$	$3\frac{1}{2} \times 8$	$5\frac{1}{4} \times 4\frac{7}{8}$
FOOLSCAP ..	$13\frac{1}{2} \times 17$	$6\frac{3}{4} \times 17$	$4\frac{1}{2} \times 17$	$1\frac{3}{4} \times 17$	$8\frac{1}{2} \times 13\frac{1}{2}$	$5\frac{5}{8} \times 13\frac{1}{2}$	$4\frac{1}{4} \times 13\frac{1}{2}$	$2\frac{1}{2} \times 13\frac{1}{2}$	$6\frac{1}{4} \times 8\frac{1}{2}$	$3\frac{3}{8} \times 8\frac{1}{2}$	$4\frac{1}{4} \times 6\frac{3}{4}$	$3\frac{3}{8} \times 4\frac{1}{4}$	$2\frac{5}{8} \times 3\frac{3}{8}$	$3\frac{3}{8} \times 5\frac{5}{8}$	$2\frac{5}{8} \times 6\frac{3}{4}$	$4\frac{1}{2} \times 4\frac{1}{4}$
POTT ..	$12\frac{1}{2} \times 15\frac{1}{2}$	$6\frac{1}{4} \times 15\frac{1}{2}$	$4\frac{1}{8} \times 15\frac{1}{2}$	$1\frac{1}{2} \times 15\frac{1}{2}$	$7\frac{1}{4} \times 12\frac{1}{2}$	$5\frac{5}{8} \times 12\frac{1}{2}$	$3\frac{3}{4} \times 12\frac{1}{2}$	$2 \times 12\frac{1}{2}$	$6\frac{1}{4} \times 7\frac{3}{4}$	$3\frac{3}{8} \times 7\frac{3}{4}$	$3\frac{3}{8} \times 6\frac{1}{4}$	$3\frac{3}{8} \times 3\frac{3}{8}$	$2 \times 3\frac{3}{8}$	$3\frac{3}{8} \times 5\frac{5}{8}$	$2\frac{1}{2} \times 6\frac{1}{4}$	$4\frac{1}{8} \times 3\frac{3}{8}$

NOTE.—The mark — placed *above* figures indicates that they are slightly less than the true ones, or, in other words, that the figures given are rather "under the mark"; placed *below* it indicates that the figures are slightly in excess of the true ones, or rather "over the mark."

For Four-Crown, Four-Demy, Four-Royal, etc., double each of the figures given for Crown, Demy, Royal, etc., respectively. This—Four-Royal Printed is 40×50 ; Four Crown 40 mo is $7\frac{1}{2} \times 10$ —Crown Quarto.

Back of
Foldout
Not Imaged

CHAPTER IV.

THE SIZES OF ORDINARY PAPERS AND CARDS AND THEIR NAMES.—

Printing Papers—Cards—Writing Papers—Foreign Papers.

WHAT has been stated of the folds and sub-divisions of paper applies to papers of all kinds, and whatever may be the dimensions of the sheets. The papermakers, however, deliver their papers cut up to various standard sizes, unless specially ordered to the contrary, and these sizes have well-known names. Unfortunately the sizes of printing papers are not always identical with those of writing papers or drawing papers bearing the same names.

Sizes of Printing Papers.—The sizes of printing papers most used are :—

Foolscap, ¹ which measures	-	-	13½ in. × 17 in.
Crown ,, ,,	-	-	15 in. × 20 in.
Demy ,, ,,	-	-	17½ in. × 22½ in.
Royal ,, ,,	-	-	20 in. × 25 in.

and the doubles of these :—

Double Foolscap, which measures	-	17 in. × 27 in.
Double Crown ,, ,,	-	20 in. × 30 in.
Double Demy ,, ,,	-	22½ in. × 35 in.
Double Royal ,, ,,	-	25 in. × 40 in.

and now that large printing machines are in vogue the quadruples are common :—

Quad. Crown, which measures	-	-	30 in. × 40 in.
Quad. Demy ,, ,,	-	-	35 in. × 45 in.
Quad. Royal ,, ,,	-	-	40 in. × 50 in.

¹“Foolscap” is often shortened into “Cap.” Demy is pronounced De-my’ not Dem’y.

Observe that in the case of the double sizes it is the shorter side which is doubled, thus: Crown, 15 in. \times 20 in.; Double Crown, 20 in. \times 30 in.; while in the quadruple sizes both sides are doubled, thus: Crown, 15 in. \times 20 in.; Quad. Crown, 30 in. \times 40 in.

There are various other sizes of printing papers, each having distinctive names, thus:—

Pott	which measures	-	-	$12\frac{1}{2}$ in. \times $15\frac{1}{2}$ in.
Post	" "	-	-	$15\frac{3}{4}$ in. \times $19\frac{1}{2}$ in.
Large Post	" "	-	-	$16\frac{1}{2}$ in. \times 21 in.
Medium	" "	-	-	$18\frac{1}{2}$ in. \times $23\frac{1}{2}$ in.
Super Royal	" "	-	-	$20\frac{1}{2}$ in. \times $27\frac{1}{2}$ in.
Imperial	" "	-	-	22 in. \times 30 in.

and the doubles and quadruples of these.

So that a full list in the order of size, beginning at the smallest, is:—

Name.	Single.	Double.	Quadruple.
Pott - - - -	$12\frac{1}{2} \times 15\frac{1}{2}$	$15\frac{1}{2} \times 25$	25×31
Foolscap - - - -	$13\frac{1}{2} \times 17$	17×27	27×34
Post - - - -	$15\frac{3}{4} \times 19\frac{1}{2}$	$19\frac{1}{2} \times 31\frac{1}{2}$	$31\frac{1}{2} \times 39$
Crown - - - -	15×20	20×30	30×40
Large Post - - - -	$16\frac{1}{2} \times 21$	21×33	33×42
Demy - - - -	$17\frac{1}{2} \times 22\frac{1}{2}$	$22\frac{1}{2} \times 35$	35×45
Medium - - - -	$18\frac{1}{2} \times 23\frac{1}{2}$	$23\frac{1}{2} \times 37$	37×47
Royal - - - -	20×25	25×40	40×50
Super Royal - - - -	$20\frac{1}{2} \times 27\frac{1}{2}$	$27\frac{1}{2} \times 41$	41×55
Imperial - - - -	22×30	30×44	44×60

The student should if possible commit these names and sizes to memory, but in any case he should always remember the sizes of Foolscap, Crown, Demy, and Royal, and their doubles and quadruples.

Some printers reckon Demy size as measuring 18 in. \times 24 in. because these figures are easy to remember and divide well; but although this is near enough for most purposes, it is not accurate.

If the sizes of the Broadside are remembered, the following rules will quickly enable any one to find the sizes of the common folios, quartos, and octavos:—

To get the size of—

The Common Folio—Halve the longer side and retain the shorter side of the broadside.

The Common Quarto—Halve both sides of the broadside.

The Common Octavo—Divide the long side by 4 and the short side by 2.

It will be obvious to the reader that of a double-size paper the folio has the same dimensions as the broadside of the single size, the quarto has the same dimensions as the folio of the single size, and the octavo as the quarto of the single size.

The learner should commit to memory the following table:—

Name.	Broadside.	Common Folio.	Common Quarto.	Common 8vo.
Foolscap ¹ - -	$13\frac{1}{2} \times 17$	$8\frac{1}{2} \times 13\frac{1}{2}$	$6\frac{3}{4} \times 8\frac{1}{2}$	$4\frac{1}{4} \times 6\frac{3}{4}$
Crown - - -	15×20	10×15	$7\frac{1}{2} \times 10$	$5 \times 7\frac{1}{2}$
Demy - - -	$17\frac{1}{2} \times 22\frac{1}{2}$	$11\frac{1}{4} \times 17\frac{1}{2}$	$8\frac{3}{4} \times 11\frac{1}{4}$	$5\frac{5}{8} \times 8\frac{3}{4}$
Demy (Conventional)	18×24	12×18	9×12	6×9
Royal - - -	20×25	$12\frac{1}{2} \times 20$	$10 \times 12\frac{1}{2}$	$6\frac{1}{4} \times 10$

Annexed is a table of the dimensions of all kinds of printing papers in ordinary use and of their sub-divisions.

Cards.—Cards are called “large” and “small,” with sub-divisions and multiples of these. They are usually cut out of a sheet of cardboard of “Royal” size, which means

¹ There are now made several new sizes, such as Sheet-and-a-half Post ($19\frac{1}{2} \times 23\frac{1}{2}$), Sheet-and-a-half Demy ($22\frac{1}{2} \times 26\frac{1}{4}$), Sheet-and-a-half Royal (25×30), and Sheet-and-a-half Double Crown (30×30). Each of these is half as large again as the simple size.

24 in. × 19 in. The following are their names and dimensions:—

	Inches.		Inches.
Third Large, or Thirds -	$1\frac{1}{2} \times 3$	Small - - -	$2\frac{3}{8} \times 3\frac{5}{8}$
Extra Third Large -	$1\frac{7}{8} \times 3$	Large - - -	$3 \times 4\frac{1}{2}$
Town Size - - -	2×3	Double Small -	$3\frac{5}{8} \times 4\frac{3}{4}$
Half Small - - -	$1\frac{7}{8} \times 2\frac{3}{8}$	Double Large -	$4\frac{1}{2} \times 6\frac{1}{8}$
Half Large - - -	$2\frac{1}{4} \times 3$	Quadruple Small -	$4\frac{3}{4} \times 7\frac{1}{4}$
Reduced Small - -	$2\frac{1}{8} \times 3\frac{9}{16}$	Quadruple Large -	$6\frac{1}{8} \times 9$

The following table shows the number of cards that can be cut from a sheet of cardboard of Royal size:—

Thirds - - -	96	Large - - -	32	Quadruple Small	12
Extra Thirds -	80	Double Small -	25	Quadruple Large	8
Small - - -	50	Double Large -	16		

Visiting Cards are of two sizes: Gentlemen's, $1\frac{1}{2}$ in. × 3 in.; ladies', $2\frac{3}{8}$ in. × $3\frac{5}{8}$ in., the latter being in fact a "small" card.

Memorial Cards are also usually of two sizes: Single, 3 in. × $4\frac{1}{2}$ in., i.e., a large card; and double, 3 in. × 9 in. The latter are usually folded to form four oblong pages.

Writing Papers.—Though by far the greater part of letterpress printing is executed on printing papers, for some work writing papers are used. It is therefore necessary to have at hand the dimensions of these papers, though the beginner need certainly not commit them to memory. We insert them here that the whole subject of dimensions of papers may be dealt with together.

The following is a list of the most usual writings, with the average weights of good qualities :—

Name.	Dimensions.	Usual Weights lb.
Emperor - - - - -	72 × 48	620
Antiquarian - - - - -	53 × 31	250
Double Elephant - - - - -	40 × $26\frac{3}{4}$	130
Atlas - - - - -	34 × 26	100
Colombier - - - - -	$34\frac{1}{2}$ × $23\frac{1}{2}$	100
Imperial - - - - -	30 × 22	72
Elephant - - - - -	28 × 23	72
Super Royal - - - - -	27 × 19	54
Royal - - - - -	24 × 19	44
Medium (varies, but now usually) - - - - -	23 × 18	34
Scribbling Demy - - - - -	$22\frac{1}{2}$ × $17\frac{1}{2}$	24
Large Post - - - - -	21 × $16\frac{1}{2}$	21
Copy - - - - -	20 × 16	18
Demy - - - - -	20 × $15\frac{1}{2}$	25
Post - - - - -	19 × $15\frac{1}{4}$	18
Pinched Post - - - - -	$18\frac{1}{2}$ × $14\frac{1}{2}$	17
Foolscap - - - - -	$16\frac{1}{2}$ × $13\frac{1}{4}$	14
Pinched Foolscap - - - - -	16 × 13	13
Sheet-and-a-third Foolscap - - - - -	22 × $13\frac{1}{2}$	22
Sheet-and-a-half Foolscap - - - - -	$24\frac{1}{2}$ × $13\frac{1}{2}$	24
Pott - - - - -	15 × $12\frac{1}{2}$	10
Sheet-and-a-half Pott - - - - -	$22\frac{1}{2}$ × $12\frac{1}{2}$	14
Envelope Paper - - - - -	19 × 19	Var.
" - - - - -	21 × 37	Var.
Bank of England Note - - - - -	$8\frac{1}{4}$ × $5\frac{1}{8}$	—
Bill of Exchange - - - - -	12 × 4	—

The *Note* and *Letter Papers*, with their most common sub-divisions, are as follows, but the sizes vary in different warehouses :—

Name.	Size.
Medium Folio - - - - -	18 × 11 $\frac{1}{2}$
„ 4to - - - - -	11 $\frac{1}{2}$ × 9
„ 8vo - - - - -	9 × 5 $\frac{3}{4}$
Large Post Folio - - - - -	16 × 10 $\frac{1}{8}$
„ „ 4to (<i>Commercial Letter Size</i>) - -	10 × 8
„ „ 8vo - - - - -	8 × 5
„ „ 16mo - - - - -	5 × 4
Demy Folio - - - - -	15 × 9 $\frac{3}{8}$
„ 4to - - - - -	9 $\frac{3}{8}$ × 7 $\frac{3}{8}$
„ 8vo - - - - -	7 $\frac{1}{4}$ × 4 $\frac{3}{4}$
„ 16mo - - - - -	4 $\frac{3}{8}$ × 3 $\frac{5}{8}$
Copy Folio - - - - -	16 × 10
„ 4to - - - - -	10 × 8
Copy 8vo - - - - -	7 $\frac{3}{4}$ × 4 $\frac{5}{8}$
Post Folio - - - - -	15 $\frac{1}{4}$ × 9 $\frac{1}{2}$
„ 4to - - - - -	9 × 7 $\frac{1}{8}$
„ 8vo (<i>Usual Note Size</i>) - - - - -	7 × 4 $\frac{3}{8}$
„ 16mo - - - - -	4 $\frac{3}{8}$ × 3 $\frac{5}{8}$
Foolscap Broad Folio - - - - -	12 $\frac{3}{4}$ × 8
„ Long Folio - - - - -	16 × 6 $\frac{3}{8}$
Foolscap 4to - - - - -	8 × 6 $\frac{3}{8}$
„ 8vo - - - - -	6 $\frac{1}{4}$ × 4
Alberts - - - - -	6 × 4
Queens - - - - -	5 $\frac{3}{8}$ × 3 $\frac{1}{2}$
Prince of Wales - - - - -	4 $\frac{1}{2}$ × 3

Foreign Papers.—Intercourse with the Continent is now so common that it is eminently desirable for English printers to know the names and dimensions of the different-sized sheets of paper used in the chief countries of Europe. Some years ago the *Printers' Register* published tables showing the names and dimensions of the papers used in France, Italy, and Germany, and these we now reproduce with the remarks annexed to them.

FRENCH.

Name.	Centimetres.	Inches.
Pot - - - - -	31 × 42	12·2 × 16·5
Poulet - - - - -	22·5 × 28	8·6 × 11·0
Couronne - - - - -	36 × 46	14·2 × 18·1
Ecu - - - - -	40 × 52	15·7 × 20·4
Coquille - - - - -	45 × 56	17·7 × 22·0
Cloche Normande - - - - -	35 × 52	13·8 × 20·4
Tellière - - - - -	33 × 44	13·0 × 17·3
Griffon - - - - -	35 × 45	13·8 × 17·7
Carré - - - - -	45 × 56	17·7 × 22·0
Cavalier - - - - -	47 × 60	18·5 × 23·6
Raisin - - - - -	50 × 65	19·7 × 25·6
Petit Jésus - - - - -	55 × 70	21·6 × 27·5
Jésus-Musique - - - - -	54 × 70	22·0 × 27·5
Grand Jésus - - - - -	56 × 75	22·4 × 29·5
Petit Colombier - - - - -	60 × 80	23·6 × 31·5
Grand Colombier - - - - -	62 × 90	24·4 × 35·4
Grand Aigle - - - - -	73 × 102	28·8 × 40·0
Grand Monde - - - - -	90 × 120	35·4 × 47·1

The sizes chiefly used are *Carré*, *Raisin*, and *Jésus*. *Tellière* is used for legal work. *Petit Colombier* is also called *Soleil*.

M. Motteroz, of Paris, who kindly revised the above table, added the following remarks:—

The sizes of papers have been, for several years, very irregular in France. The above dimensions are the most generally accepted.

Poulet is the quarto of *Coquille* after having been trimmed for making 8vo letter paper. It is at first 22·05 × 28 cm., but after trimming it is about 21 × 27 cm.

Coquille is of the same dimensions as *Carré*. The papers differ only as regards make and surface. It is of the different *Coquilles* that writing paper is made. *Carré* is the term used for printing papers of the same size. The pulp used for *Coquille* (*la pâte Coquille*) serves for all the other sizes of paper used for writing upon, or for hard printing papers. Stationers therefore talk of "*Couronne pâte Coquille*," "*Raisin pâte Coquille*," etc. The word "*Coquille*," thus, has two meanings. Generally it signifies a hard paper of 45 × 56 cm., and this is always what is sent by the stationers if no other word is added to modify the signification. "*Donnez-moi de la Double Couronne pâte Coquille*," means, "Give me some writing paper 46 × 72 cm."

Stationers generally keep the various papers in double and quadruple sizes, and printers cut them up when they want a single size.

"*Petit*" and "*Grand*" are no longer used in connection with "*Raisin*."

Jésus and the sizes larger have no longer uniform dimensions. In every warehouse there are several sizes of *Jésus*, *Colombier*, etc., and it is seldom that the *Jésus*, etc., of one maker tallies with the papers of the same names made by other houses. The cause of these differences is the desire of every publisher to have volumes different in size from those of his *confrères*.

The dimensions given above are those of machine-made papers. Hand-made papers are always one or two centimetres less each way.

ITALIAN.

The following are the usual sizes of Italian papers :—

Name.	Centimetres.	Inches.
Ottavina - - - - -	13·5 × 21	5·3 × 8·5
Sestina - - - - -	18 × 22·5	7·1 × 9·0
Quartina - - - - -	21 × 27	8·3 × 10·6
Mezzanella - - - - -	23 × 36	9·0 × 14·2
Olandina - - - - -	25 × 39	9·8 × 15·3
Quadrotta (formato Francese) -	26·5 × 42	10·4 × 16·5
„ (formato Italiano) -	27·5 × 44·5	10·6 × 17·4
„ (formato Tedesco) -	29 × 48	11·4 × 18·9
Processo, or Notarile - -	26 × 38	10·2 × 15·0
Protocollo, or Pellegrina - -	31 × 42	12·2 × 16·5
Rispetto - - - - -	33 × 45	13·0 × 17·7
Stato, or Leona - - - - -	36 × 48	14·1 × 18·9
Bastarda - - - - -	42 × 56	16·5 × 22·1
Realino, or Mezzana - - -	45 × 60	17·7 × 23·6
Reale - - - - -	50 × 65	19·7 × 25·5
Realone - - - - -	52 × 69	20·4 × 27·1
Imperialino - - - - -	54 × 76	21·2 × 29·9
Imperiale - - - - -	61 × 81	24·0 × 32·0
Elefante - - - - -	66 × 96	26·0 × 37·8
Aquila - - - - -	70 × 100	27·5 × 39·4

FOREIGN PAPERS.

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GERMAN.

Herr Goebel, of Stuttgart, furnished the following information :—

Schreibpapier (Writing Paper) :—

Name.	Centimetres.	Inches.
Schlängle - - - - -	31 × 39·5	12·2 × 15·3
Canzlei ¹ - - - - -	33 × 42	12·9 × 16·5
„ (Untrimmed) - - - - -	34 × 43	13·10 × 16·9
Propatria - - - - -	36 × 44·5	14·1 × 17·3
Löwen - - - - -	37 × 48	14·3 × 19·2

Bücher und Zeichnen-Papier (Paper for Account Books and for Drawings, the former being glazed, the latter not) :—

Name.	Centimetres.	Inches.
Klein Median - - - - -	40 × 51	15·6 × 20·0
Median - - - - -	42 × 54	16·5 × 21·5
Gross Median - - - - -	44 × 58	17·3 × 23·2
Klein Royal - - - - -	48 × 63	19·2 × 24·8
Noten Royal (for Music) - - - - -	50 × 67	19·9 × 26·3
Gross Royal - - - - -	52 × 68	20·7 × 27·1
Super Royal - - - - -	54 × 72	21·5 × 28·2
Imperial - - - - -	58 × 76	22·8 × 29·8
Klein Adler - - - - -	62 × 90	24·4 × 35·5
Elephant - - - - -	67 × 92	26·3 × 36·3

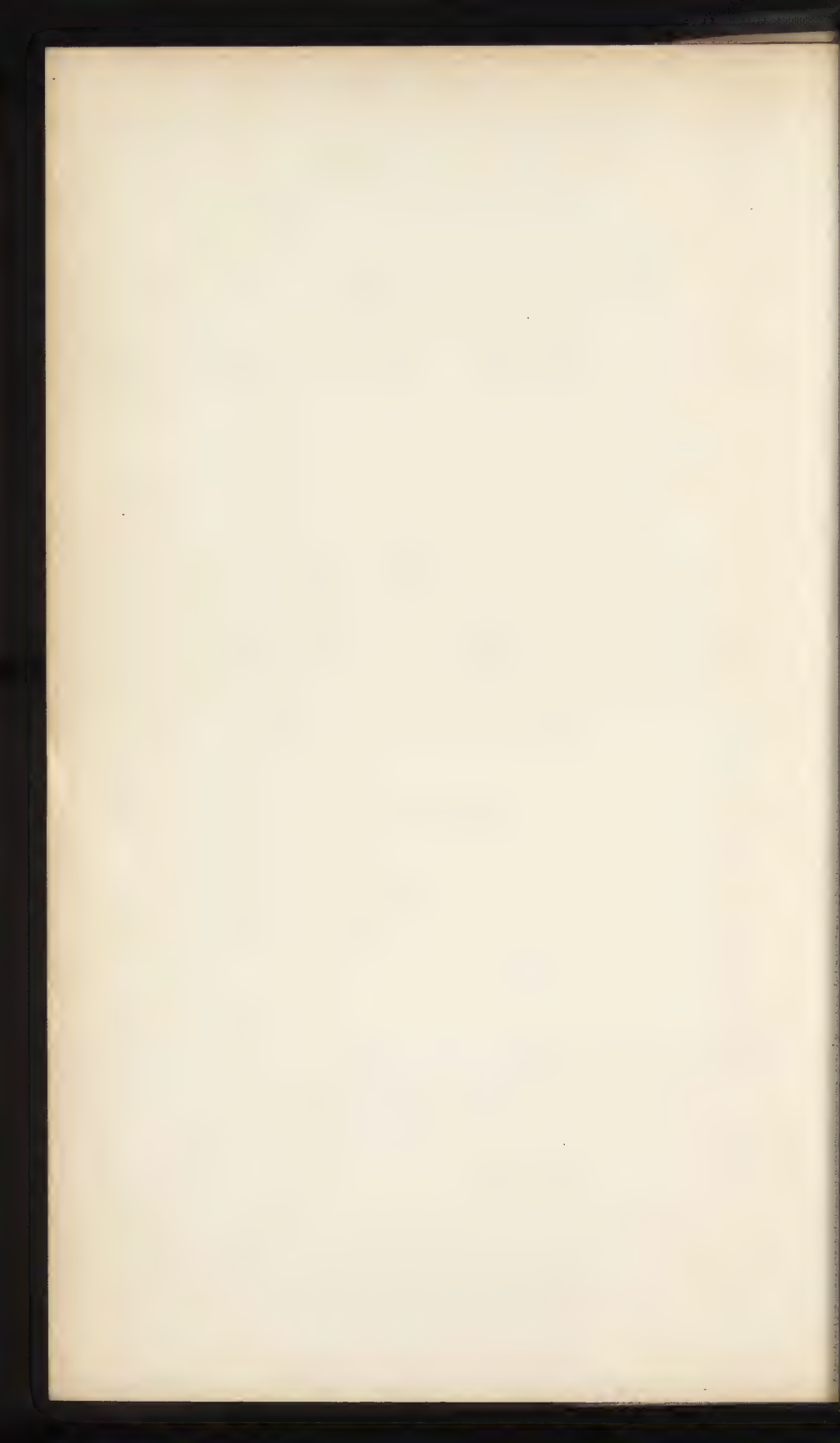
Printing Papers.—There used to be no fixed sizes of printing papers in Germany, the sheets being always cut to order, each publisher choosing his own size.

Lately, however, the leading firms have fixed twelve so-called “normal sizes” :—

Size.	Centimetres.	Size.	Centimetres.	Size.	Centimetres.
No. 1	32 × 42	No. 5	40 × 50	No. 9	48 × 64
„ 2	34 × 43	„ 6	42 × 53	„ 10	50 × 65
„ 3	36 × 45	„ 7	44 × 56	„ 11	54 × 68
„ 4	38 × 48	„ 8	46 × 59	„ 12	57 × 78

¹ Also called “Reichsformat,” from its adoption in all Government offices.

BOOK II.
COMPOSITION.



PART I.

THE TYPES AND APPLIANCES DESCRIBED.

CHAPTER V.

TYPES.—The Parts of a Type—Classification of Types—a Fount of Type—Names and Sizes of Type Bodies—Relation of Body to Face—Variations of Face Design.

Types.—A type, as stated in the second chapter, is a piece of metal or wood, generally rectangular; which has cast or cut in relief on one (the top) of its six sides the distinctive design it is to impress.

The Parts of a Type.—Each part of a type has a distinctive name; the main parts are the “face” and the “shank.”

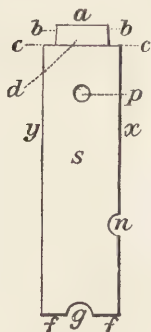
The *face* of a type is that portion of its upper surface from which the impression is taken. It is marked *a* in the annexed diagram.

The faces of some types are divided into parts. In capitals such as M the outline M is called the *stem*, and the thin horizontal lines at the top and bottom of each upright stroke are called *serifs* (also spelt *cerifs*, *ceriphs*, and *surryphs*).

A capital letter *without* serifs is called *sans-serif*, or, as it is often written, *sanserif*.

In such characters as the sloping or “italic” *f*, *j*, *y*, *p*, etc., part of the face overhangs the shank; such part is called the *kern*.

The *beard* comprises the top of the type below the bottom line of the face; it is divided into the *bevel*, or sloping portion, marked *b* in the annexed figure, and the *shoulder*, or flat portion, marked *c*.



When types are set up close together there is a little space between the faces; this is called the *counter* (*d*).


The *shank*, marked *s*, is the entire body of the type, exclusive of the face. The front part of it (*x*) is called by compositors the *belly*; the corresponding part on the other side (*y*) is called the *back*.

The *nick*, marked (*n*), is a groove extending horizontally across the shank a little above the feet.¹ Its use is twofold. It enables the workman to know which is the bottom of the letter at first sight instead of scrutinizing it, a matter of the greatest importance, as will be seen when the process of "composition" is described. The nick also distinguishes between letters of an equal size of body but of a different description of face; for founts of the same sized type, with different faces, are generally distinguished by the founders by variations in the number or position of the nicks.

Certain letters in common founts have nicks on the *back* of the shank near the shoulder to distinguish them from other letters for which they might be mistaken. Such, for instance, as the small capitals *o*, *s*, *v*, and *w*, which are nicked to distinguish them from the ordinary or "lower-case" *o*, *s*, *v*, and *w*.

The *groove* (*g*) divides the bottom part of the type, or that on which it stands, into two parts, which are called

¹ In English and American type the nick is always on the front or "belly" of the type; in French and other type it is on the opposite (or back) side of the type.

The *feet* (*f*). The annexed is an impression from a type turned upside down, and shows the feet, . Some printers call the whole of the under portion of a type the foot, but by the majority the groove is held to divide that part into two, these being the *feet*.

In most type there is a little round indentation (*p*) on the side of the shank. This is called the *pin-mark*, and is caused by a projecting pin of the type-casting machine. Sometimes, especially in America, the pin-mark is made to indicate the size of the type.

Types should be perfectly rectangular, and of an equal thickness throughout the shank. When types were cast exclusively in the hand-mould two principal imperfections were experienced. One of these consisted in the type being broader at the lower extremity than at the top, the other in the upper part being broader than the lower part. These imperfections are now very seldom encountered.

Any roughness at the sides of the types, owing to their being imperfectly rubbed or "dressed," is called a *burr*.

Battered Types.—Types which have sustained some injury to their faces, sufficient to render imperfect the impression taken from them, are said to be *battered*.

Any foreign matter that adheres to the face of a type, such as paper, roller composition, or hardened ink, clogs or fills it up, and causes a blotch in the impression. This is called a *pick*.

Kinds of Types.—Classified according to the purposes for which they are chiefly used, types are either (*a*) book or newspaper types, or (*b*) jobbing or fancy types.

Book or Newspaper Types consist of Roman and Italic letters. The Roman letters are upright, like most of those in this paragraph, and the Italic sloping, thus: *Italic*.

Jobbing Types are used for cards, circulars, handbills, advertisements, posters, etc. There are innumerable kinds of them.

Sizes of Types.—Types are of various sizes or bodies, varying from very small to very large. Each body has a distinctive name, as pica, bavier, minion, etc. Fancy types have fancy names, given to distinguish them from one another. Type-founders give book types arbitrary numbers, as pica 18, pica 24, because the faces of all types of the same name are not exactly alike, and these numbers identify the faces.

A Fount of Type.—A complete assortment of types is called a “Fount.”¹

A fount of book or newspaper types consists of the following descriptions of characters, *viz.* :—

Letters.	Points.
Diphthongs.	Reference Marks.
Ligatures.	Metal Rules.
Accented Letters.	Leaders.
Figures.	Braces.
Fractions.	Signs.

It also comprises Quadrats and Spaces of various widths.

Founts of jobbing type include only some of these characters.

Letters are of three kinds, *capitals*, as M, *small capitals*, as m, and *small letters*, as m. Owing to the positions they occupy in the “cases,” the capitals and small capitals are called “upper-case” letters, and the small ones “lower-case” letters. Among printers the word “capital” is usually abbreviated to “cap.”

The Capital letters used in the English language are :—

A B C D E F G H I J K L M N O P Q R S T U V
W X Y Z.

¹ When an order is given for an incomplete assortment of types, as, for example, for a certain quantity of different specified letters, it is said to be an order for *sorts*. So when a compositor is deficient of certain types he is said to be “out of sorts.” Type-founders call any supplementary supplies to founts “imperfections.”

The Small Capital letters are :—

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z.

The Lower-case letters are :—

a b c d e f g h i j k l m n o p q r s t u v w x y z.

Diphthongs.—There are two Diphthongs, and they are made to correspond in shape with the capital, small capital, and lower-case sorts respectively, thus :—

Æ Œ, æ œ, æ œ.

Ligatures.—Certain types representing two or more letters, as f and i, which, on account of one or both having overhanging parts, could not be brought closely together without injury, are supplied cast on one shank, and are known as *Ligatures*. The top of the f would either override the dot of the i or be broken off were the two brought into juxtaposition; hence the two letters are cast on one shank. The only ligatures¹ found in modern founts are five, viz. :—

ff, fi, ffi, fl, and ffi.

There are, however, several book and jobbing founts quite recently introduced, in which the letter f is designed without an overhanging part; in these the ligatures, though usual, are unnecessary.

Accented Letters.—These are the five vowels with certain marks over them, and named thus :—

Acute	á	é	í	ó	ú
Grave	à	è	ì	ò	ù
Circumflex	â	ê	î	ô	û
Diaeresis	ä	ë	ï	ö	ü
Long	ā	ē	ī	ō	ū
Short	ǎ	ě	ǐ	ǒ	ǔ

¹The diphthongs are also ligatures, but as they have a specific name it has not been thought advisable to class them with the so-called "double letters."

Along with the accents may be classed the two modified letters ç (c with cedilla) and ñ (tilde). The former is for use in words, such as façade, adopted into our language from the French, and the latter for Spanish words like señor, cañon. These modified letters ought always to form part of a fount of book or news type. For Welsh, and some foreign languages, other accents and modified letters besides those given above have to be used, but they are supplied only when specially ordered.

Characters are cast representing the accents only; they are called *loose* or *floating accents*, and are put above and below jobbing types as may be required. Accent marks are also sometimes cast on separate shanks, and used in combination with ordinary letters, particularly in Greek and Hebrew founts.

Figures.—These are called Arabic numerals—1 2 3 4 5 6 7 8 9, and the cypher 0, to distinguish them from the Roman numerals, I, II., III., IV., etc.

Fractions.—Certain *fractions* are cast in one piece, and supplied with every complete fount. They are— $\frac{1}{4}$ $\frac{1}{2}$ $\frac{3}{4}$ $\frac{1}{3}$ $\frac{2}{3}$ $\frac{1}{8}$ $\frac{3}{8}$ $\frac{5}{8}$ $\frac{7}{8}$. These are one en¹ in width. There are also the *compound fractions*, $\frac{1}{16}$ $\frac{3}{16}$ $\frac{5}{16}$ $\frac{7}{16}$ $\frac{9}{16}$ $\frac{11}{16}$ $\frac{13}{16}$ $\frac{15}{16}$, each an em¹ in width. If other fractions are needed they have to be made up with small types, called *split fractions*, which are half the depth of the body of the type they are to be used with. The horizontal stroke dividing the numerator (the upper figure) from the denominator (the lower figure) is cast on the latter, thus $\frac{1}{2}$. For greater clearness, some printers prefer fractions formed with a diagonal line between the

¹ An "em" is a unit of measure varying with the bodies of types. It is always equal to the depth or body of the type of which the fount is composed. An "en" is one-half an "em." These names were given to the measures because in book founts the type for the letter "m" was usually exactly as wide as it was deep, and the type for the letter "n" half as wide as it was deep.

two parts thus $\frac{1}{2}$; these are called *sloping fractions*, and they are generally one em in thickness.¹ The whole of the ten ordinary fractions are cast on em bodies, similar to the fraction $\frac{1}{2}$, and supplied to order.

Points.—The *points*² are named thus :—

Comma ,	Period or Full-stop .	Parenthesis ()
Semicolon ;	Interrogation ?	Brackets []
Colon :	Exclamation !	Hyphen -
	Apostrophe ' ,	

Reference Marks are named as follows, and used for notes and other references in the order in which they are here set out :—

* Star (1)	‡ Double Dagger (3)	|| Parallel (5)
† Dagger (2)	§ Section (4)	¶ Paragraph (6)

When there are more than six notes in a page the reference marks are simply doubled ; thus, after the ¶ come successively ** and ††, etc. But these are seldom used now, for when references to footnotes are at all numerous it is usual to employ figures or letters of the alphabet.

Metal Rules are short horizontal lines cast in the middle of the top of the shank. They are of five kinds, the em rule —; the en rule, half the width of the em; the two-em rule,³ the three-em rule, and the four-em rule.




Leaders consist of two or three dots similar to full points (.. or ...) cast on an em of its own body. There are also

¹ "Thickness" and "width" are synonymous as regards types.

² "Points" is here used to include a class of symbols which are, variously, marks of punctuation, signs adopted for the purposes of elocution, and characters for other uses. The word is not strictly applicable to some of them, but technically the classification is convenient.


³ "Two-em" means twice the width of an em, or twice as wide as the type is deep; "three-em," three times that width.

two, three, and four-em leaders, the number of dots being multiplied according to the breadth to which they are cast. Sometimes, for table work, leaders are supplied cast on $2\frac{1}{2}$, $3\frac{1}{2}$, or $4\frac{1}{2}$ -em bodies, as required.

Braces are characters composed of two long curves, thus . They are cast in different sizes, to embrace two, three, or four lines of type, and are called respectively two, three, and four-em braces. When a brace is required to extend over any large space it is generally composite, consisting of parts, called *middles* () and two *corners* (). Metal rules are used, and the brace is made up thus:—



Braces are now cast on a nonpareil body in depth, but to 2, 3, 4, or more ems of any larger body in length.

Signs.—The *signs* are—the ampersand, or “short and” (&),¹ the symbol for libra or pound sterling (£), for dollar (\$), for the word per (p), at (@), for the pound avoirdupois (lb). The “shilling stroke” (/) is sometimes supplied for dividing shillings and pence, thus 15/2. There is also supplied the index, or, as compositors call it, the hand or fist () which is used to point out lines or passages of importance. Other characters are occasionally included in a fount arranged for a special purpose; as will be seen hereafter in the Chapter on Signs.

Italic letters follow, generally speaking, the shape of the Roman, but have an oblique inclination. The following is a complete alphabet:—

Capital letters:—

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

¹ This was originally a ligature & (*et*, Latin for *and*), and when the alphabet was repeated rapidly the last character named was “*et per se, and*” (that is, *et* by itself, *and*), which became corrupted to “*and per se and*,” and thence to “ampersand.”

Lower-case letters :—

a b c d e f g h i j k l m n o p q r s t u v w x y z

The number of long and short, kerned, and other varieties of letters is different in Italics to Roman. The points cast with the italic inclination are the () ? ! ; : —the other points used being the same as the Roman.

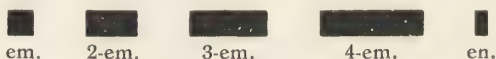
Figures are now often included in italic founts—

1 2 3 4 5 6 7 8 9 0


Only in exceptional cases are italic founts furnished with small capitals.

Spaces and Quads.—A fount of book or newspaper type includes the pieces of metal which are called *spaces* and *quads*. These, as we have seen, are less in height than the printing characters ; they are not intended to make any impression. Their use is to separate words and letters, and to make lines of types of uniform length.

Quads, or more properly “quadrats,”¹ are of various widths, these widths being multiples of the em or depth of the type. They are of five kinds : The em, the two-em, the three-em, the four-em, and the en. The following show the quads belonging to the type in which this line is set :—







For use with split fractions like $\frac{2}{17557}$, en and em quads are cast to half the depth of the body.

Triangular Quads, as , are also used for fancy composition ; they are the shape of a right-angled triangle, and two of them exactly make a square em quad. These and the half-depth quads are not supplied with ordinary founts.

¹ From the Latin *quadratus*, squared. As the words “em” and “en” are likely to be confounded, compositors often call em quads “mutton quads” and en quads “nut quads.”

Spaces are of four kinds, and called respectively thick, middle, thin, and hair spaces.

			
Thick.	Middle.	Thin.	Hair.
(3 to em.)	(4 to em.)	(5 to em.)	

Three thick spaces, or four middle spaces, or five thin spaces, equal one em quad. The hair spaces range between seven and ten, according to the size of the body.

A Fount of Type means not only a complete collection of all ordinary characters, but quantities of each different character in proper proportion. Every one knows that in the formation of words the letters e, i, a, s are much more frequently used than j, k, q, v, x, z, and it would therefore be absurd to supply an equal quantity of each. It has been found by experience in ordinary English composition, that for every j or x there will be wanted about 28 e's, 20 t's, 18 a's and i's, 16 n's, o's, and s's, 14 r's, 12 h's, 10 d's and l's, 8 c's, 6 f's and m's, 5 p's, w's, and y's, 4 b's and g's, and 3 v's. Therefore, in book and news founts the type-founders supply the characters in about these proportions. Thus, if the fount contains 3,000 m's, it should contain 14,000 e's, 10,000 t's, and so on. Some founders (*e.g.*, Messrs. Caslon & Co. and the Scotch type-founders) apportion the characters, not by numbers, but by weight, *e.g.*, 7 lb. of e to 4½ lb. of a.

The Number of Different Characters in an ordinary fount of Roman type is 157, exclusive of leaders, metal rules, and braces. An ordinary fount of Italic type embraces 90 different characters. Spaces and quads are of course not counted in these numbers.

The reason why the fount of Italic contains fewer characters than the fount of Roman, is that in Italic there are no small capitals, and the only points cast with the Italic inclination are the () ? ! ; :—the Roman points being

used for the comma, full point, etc. There are also no reference signs, and occasionally no figures, in the ordinary fount of Italic.

Analysis of an Ordinary Fount of Roman and Italic.—The numbers of different characters (157 and 90) given on the previous page are made up thus:—

Roman capitals, including Æ and Œ	- -	28
„ small capitals, do.	- - -	28
„ lower case, including & and ligatures		34
„ lower case accented letters	- -	22
„ points and references	- - -	16
„ figures 10, fractions 10, £, lb, etc., 9		29
	—	157
Italic capitals, including Æ and Œ	- -	28
„ lower case, including & and ligatures	-	34
„ lower case accented letters	- -	22
„ points	- - - - -	6
	—	90
		<hr/> 247 <hr/>

The size of a fount of book and news type is indicated by the number of lower-case m's, by which the number of each of the sorts is regulated. On the next page is a table of an English type-founder's bill of 3,000 m's.¹

¹ Such a fount would weigh about 710 lb. in pica, 480 lb. in long primer, 370 lb. in bourgeois, 300 lb. in brevier, 260 lb. in minion, or 210 lb. in nonpareil. There is a tradition in the oldest English type-foundry—the Caslon, in Chiswell Street, London—that the bill originated in a laborious and elaborate calculation of the number of letters used in setting a lengthy debate in the House of Commons, where it was supposed the best and most comprehensive English would be spoken. Almost every type-founder's bill, however, fails lamentably at times to give satisfaction. It is a somewhat singular fact that the matter of Charles Dickens's works will empty the vowel boxes long before those of the consonants, and that Lord Macaulay's style, with its rounded periods and Latin terminations, will run with like persistency

The numbers of the respective letters are based on the requirements of the English language. Other languages would require sorts in different proportions. In Latin and French, for instance, more of *q* and *u* would be wanted, but very few of *h* and *w* would be needed. The Welsh language would require a larger supply of *d*, *y*, *w*, *l*, and would not require *j*, *k*, *q*, or *x*. In fact, every language requires special proportions.

Jobbing and fancy type is put up according to a different scale altogether. The basis is generally the A and a, and not the m.

Further Classification of Letters.—According to the positions the letters of the alphabet occupy on the top of the shank they are divided into short letters, ascending letters, descending letters, and long letters.

Short Letters are those types which have the face cast in the middle of the top of the shank, thus leaving an open space above them corresponding to that below. Of this description are a, c, e, m, n, o, r, s, u, v, w, x, and z, to which may be added the whole of the small caps.

Ascending Letters are those whose stems extend to the back of the shank. This class includes all the capitals, and, in the lower-case, b, d, f, h, i, k, l, and t.

Descending Letters are those which have a stem extending over the shoulder. They are the lower-case g, p, q, and y.

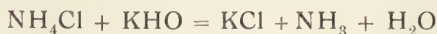
Long Letters are those which are both ascending and descending. They include, for instance, the capital Q and lower-case j, and the italic *f*.

on consonants. No amount of calculation or precaution will provide for such peculiarities, and, indeed, the proportions of the sorts are different now from what they were a few years ago, as may be seen by comparing the present "bill" with that published in previous editions of this work. It has been kindly revised for us by Mr. E. Pechey, the London manager of Messrs. Stephenson, Blake, & Co.

Superiors.—For purposes of reference to foot notes, and for use in algebraic and scientific works, small letters and figures are cast upon the upper part of the shank. These are called *superiors*. The following are examples:—

$$\text{Bacon}^a; (a + b)^3, (r - 1)^n.$$

Inferiors.—Letters and figures of the opposite character, or those whose faces are on the lower part of the shank, are called *inferiors*, thus:—



It is obvious that the distinction between ordinary letters and superiors or inferiors is found in the unusually large white space at the bottom or top of them respectively.

Names and Sizes of Type-bodies.—Types are called by distinctive names according to their depths or bodies. The following is a list of the bodies now cast by the British founders, commencing with the smallest: Semi-Nonpareil or Minikin, Brilliant, Gem, Diamond, Pearl, Ruby, Nonpareil, Emerald, Minion, Brevier, Bourgeois, Long Primer, Small Pica, Pica, English, Two-line Brevier, Great Primer, Two-line Long Primer or Paragon, Double Pica, Two-line Pica,¹ Two-line English, Two-line Great Primer, Two-line Double Pica, and Canon.² Above Canon the sizes are distinguished by their relation to Pica, and are called Four-line Pica, Five-line Pica, Six-line Pica, etc.³

¹ “Two-line” means “twice the depth of;” “Four-line” = “four times the depth of.” Two-line Pica is so called because the depth of its body is equal to twice the depth of Pica. It might be thought that Double Pica and Two-line Pica are synonymous terms; but they are not so, as Double Pica corresponds with Two-line *Small* Pica. In America, however, Double Pica means Two-line Pica.

² Canon is Four-line Pica in body, but about Three-line in face.

³ The conventional pronunciation of some of the names above is as follows: Pi'-ka, Prim'er, Berjois', Breveer', Min'yun, Non'parel.

Many of the larger bodies are so cast as to form perfect multiples of the smaller ones, thus:—

Brevier	=	Two-line Gem.
Bourgeois	=	„ Diamond.
Long Primer	=	„ Pearl.
Small Pica	=	„ Ruby.
Pica	=	„ Nonpareil.
Great Primer	=	„ Bourgeois.
Paragon	=	„ Long Primer.
Double Pica	=	„ Small Pica.

The titles “Two-line Pearl,” “Two-line Nonpareil,” “Two-line Bourgeois,” and so forth, will be found in the type-founders’ specimen books in connection with certain ornamental and other types, and the learner may ask why such types should not have been called “Long Primer,” “Pica,” and “Great Primer” instead. The object in the difference of the nomenclature is to indicate to the printer that there is no beard to the letters called Two-line Pearl, etc.; in other words, that it is a full-faced letter.

The following specimens of types used in book printing show the relation of the various bodies one to the other; the black marks at the ends of the lines are impressions of the feet of lower-case n’s; they show the exact depth of each body:—

Brilliant is the name of this type; it is the smallest book letter, and is used chiefly for pocket dictionaries, and side notes on Bibles and

Diamond is the name of this type; it is used chiefly for pocket prayer books, bibles, dictionaries, and other small editions.

Pearl is the name of this type; it is used chiefly for railway time tables and work that requires to be co

Ruby is the name of this type; it is used chiefly for all kinds advertisements for newspaper.

Nonpareil is the name of this type; it is used chiefly for newspaper advertisements.

Emerald is the name of this type; it is used chiefly for newspaper advertisements.

Minion is the name of this type; it is used chiefly for newspaper advertis

Brevier is the name of this type; it is used chiefly for all newspapers.

Bourgeois is the name of this type; it is used chiefly for newspap

Long Primer is the name of this type; it is used chiefly for b

Small Pica is the name of this type; it is used chiefly f

Pica is the name of this type; it is used chiefly

English is the name of this type; it is us

Great Primer is the name of this t

Double Pica is the name of th

Relation of Body to Face.—It is obvious that there is a proportion between the sizes of the faces of types and their bodies, and, as a rule, the larger the face, the larger the body. Within limits, however, the size and style of the face may vary without varying the body. Here, for instance, are faces of various sizes and styles all on shanks of the same body:—

A B C

A B C

A B C

Standard of Breadth.—As alphabets on the same body vary in breadth and depth, the standard breadth of book and newspaper type is ascertained thus: All the letters of the

lower-case alphabet are placed together in a line. If they occupy a space less than that occupied by twenty-six ens of the same fount, the fount is said to be *condensed*, or, as the compositors call it, "a lean fount;" if they occupy more it is said to be *expanded*. This refers particularly to the speed with which compositors can set the regulation quantity of 1,000 ens (an hour's work), it being obvious that a "fat" type could be set much more quickly than a "lean"-faced fount. Type-founders, however, use the words "condensed" (or compressed) and "expanded" (or extended) without reference to this rule.

Here are instances of condensed and expanded letters:—

MO

Condensed.

MO

Expanded.

Types very much condensed are termed *elongated*.

Fat-faced, etc.—Types also vary in the strength and thickness of the strokes forming their faces. If they are very heavy and massive they are called *fat-faced*; if fine and delicate, *lean-faced*.

Bastard Founts.—Types whose face is not in proportion to the depth of the shank are called *bastard*. A face of the size appropriate to a type running ten to the inch, if cast on a type that runs six to the inch, is, for instance, of this kind. Types thus designed have a larger open space at the bottom than ordinary ones, which is the object for which they are so made. They obviate the necessity for using leads. Thus, Ruby-Nonpareil, Brevier-Bourgeois, etc.

Variations of Face-design.—It has already been stated that the faces of book types are upright (called Roman) and sloping (called Italic), and that they are of many different sizes. It has also been seen that letters may be condensed and expanded. It now remains to be stated that the faces of types vary indefinitely according to the skill and fancy of the designer.

Book and News Type.—There are two distinct styles of faces, the Old Style and the Modern.

The difference between them will be apparent on contrasting the two specimens below:—

This is OLD STYLE Type, Roman *and Italic*.

This is MODERN Face Type, Roman *and Italic*.

The great majority of newspapers are printed in Modern face type. For books and magazines the two styles are about evenly divided.

The Old Style was the almost universal style a hundred and fifty to two hundred years ago. In the first half of the nineteenth century it gave way exclusively to the Modern style, and then was resuscitated with various slight modifications.

Modern Face.—Each type-founder has designed many different styles or “series” of modern faces to suit the various tastes and requirements of printers. Some are heavy and some light in design. Some as big as the body will hold and some comparatively small. Some are bold or expanded and some condensed. Here, for instance, are two styles both on pica body, and both cast by the same founders (Miller & Richard):—

Pica type, thin and thick face.

Pica type, thin and thick face.

To distinguish the various faces the founders give them numbers. Thus, Pica No. 18, Pica No. 20, Long Primer No. 19, Long Primer No. 25, etc. Faces of the same style on different bodies usually have the same number, and are said to be of the same “series.” *E.g.*, Miller & Richard’s Long Primer No. 30, Bourgeois No. 30, Brevier No. 30, Minion No. 30, and Nonpareil No. 30 are all of the same series.

Old Face.—The following is a complete alphabet of pica as designed by William Caslon, about 1734. It is still procurable of his successors at the Caslon Foundry.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

a b c d e f g h i j k l m n o p q r s t u v w x y z

& æ œ ct ff fi fl ffi flb fh fi fk fl ff ffi flt

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

a b c d e f g h i j k l m n o p q r s t u v w x y z

Œ æ œ ct ff fi fl ffi flb fh fi fk fl ff ffi flt

It will be observed that there are several ligatures in this fount not used in ordinary Roman founts, as well as two forms of the letter s.

The Modernised Old Style is more regular in form than the original old style; the duplicate s (f) has been abandoned, and the number of ligatures has been assimilated to that in founts of modern face type; some founders, however, still include several of the old ones.

For the sake of distinction it is usual to call the real old style "Old Face" and the modernised form of it "Old Style."

The difference in appearance between the original old face and the modern old style is apparent in the following lines:—

Old Face (Caslon's):—

The ART Preservative of Arts.

Modernised Old Style (Miller & Richard's):—

The ART Preservative of Arts.

The old style figures are less regular than the modern ones, and are thought by some to be more distinct. The difference will be seen readily in the following :—

£ 1 2 3 4 5 6 7 8 9 0
 £ 1 2 3 4 5 6 7 8 9 0

As in modern face so in old style, there are many variations of face design. Thus, Messrs. Caslon, who have a series of modernised Old Style as well as their original Old Face, have recently added a variety they call Old Roman :—

Small Pica Old Roman Type.

The French use a character lighter and more condensed than ours, and, as it finds favour here for some kinds of work, founts of it are now cast by some English founders. Here is a line of it from the foundry of P. M. Shanks & Sons :—

Type called GALLIC Old Style.

The capitals of the French or Gallic Old Style are much esteemed for title pages. Here is a specimen :—

WISE QUEEN.

Below is another style from the same founders :—

Brevier Monarch Type.

And yet another which they call “Venetian” :—

Venetian or Jenson. Wm. Morris.

This last is an ancient form revived by the late William Morris for some of the handsome works issued from his Kelmscott Press. It is procurable from various founders. Sir Charles Reed & Son and the American founders call it “Jenson.” It is but seldom used in book work, and is more appropriately a jobbing letter.

Jobbing Type is so called because it is used for "jobs," *i.e.*, for cards, circulars, letter headings, advertisements, etc. It includes a multitude of fanciful forms of letters, chiefly founded on the shape of the Roman and Italic letters. The variations are intended to give the characters greater prominence, lightness, elegance, etc.

It is very difficult to make any satisfactory classification of Jobbing letter, but the following is that generally recognised:—

- (a) Plain Types (modern and old style).
- (b) Antiques (modern and old style).
- (c) Sanserifs.
- (d) Blacks.
- (e) Scripts.
- (f) Ornamented or Fancy Founts.

On this and succeeding pages we give various examples of well-known styles.

The first division includes condensed and expanded book faces, fat-faced letters, and a species of characters called *Titling Letters*. These last consist of the plain Roman capital letters modified only in their proportions; they vary from very narrow or condensed to very broad or expanded, and from very light to very bold or heavy:—

CONDENSED. BOLD. EXPANDED.

The following type, which closely resembles a fat-faced modern book type, is called *Albion*:—

Britain, once called Albion.

A somewhat analogous old-faced letter is named *De Vinne*, after a celebrated living American printer:—

Theodore De Vinne.

Antiques.—The types known as Antique are heavy-faced Romans and Italics, whose shapes are of nearly uniform thickness, as **Antique**. Some founders call bold-faced antiques which correspond to the modern-faced Romans by the name of *Ionic*, while a still bolder and heavier style often goes by the names of *Clarendon* and *Egyptian*.

The old style faces, when thickened, are generally called Old Style Antiques, though some of them go by fancy names.

Sanserif or *Sans-serif* (without serif, often shortened to “Sans” in the printing office) is, as its name implies, a type the face of which has no serifs, as:—

PRACTICAL PRINTING.

In its heavier form it is called by some founders *Grotesque*, by others *Doric*. Some sanserif founts have lower-case letters and figures thus:—

Practical Printing, 5th Ed.

but many of them have caps only. Some are modified by the adding of ascending and descending strokes thus:—

CASTLES IN GERMANY

and therefore the ordinary form is sometimes spoken of as “lining sans.”

Black Letter.—The character known as Black Letter is a modification of the Gothic character used in Germany, and was the face cut by the first printers and type-casters, all the works of Gutenberg, Schoeffer, and Caxton being printed in it, while till 1784 it was always used for Acts of Parliament. Here is an alphabet of caps and lower-case in Caslon's Old Black:—

A B C D E F G H I J K L M N O P Q R
S T U V W X Y Z

a b c d e f g h i j k l m n o p q r s t u v w x y z
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

The early founts of Black Letter had no figures, the numerals i., ii., iii., iv., etc., being always used, except where ordinary old style figures were interposed; but now some founts are supplied with an adaptation of the Arabic numerals, as :—

1 2 3 4 5 6 7 8 9 0

Black Letter faces have undergone many modifications, and many varieties can be obtained, some heavy, some light, some expanded, and some condensed. There are also “open blacks” or letters outlined only, and “rimmed blacks,” that is letters having supplementary lines (the titles of newspapers such as the *Times* afford an instance). In addition there are sloping or Italic Blacks, but these are now little used.

Scripts represent the modern cursive or Italian handwriting. There are many forms of this character; here are two from the foundry of Stephenson, Blake, & Co :—

The Printers' Register.

Stephenson's Freehand Script.

Ornamented or Fancy Founts.—It is altogether impossible to enumerate or describe all the varieties of fancy founts, for there are several hundreds. Additions to them are being frequently made, and styles once popular are constantly going out of fashion and disappearing. The only method of becoming well acquainted with this kind of type is by examining the founders' specimen books, in which the several varieties are duly named. These names are given to them on an entirely arbitrary principle, and form no indication whatever of the design or style, and, unfortunately, the same style of character is often given a different name by

each founder who casts it. For instance, the following type :—

WHARFEDALE, OTLEY

which is called “Grecian” by Miller & Richard, is designated “2-line Ornamented No. 31” by Caslon & Co., and “2-line Old Style Grotesque” by Stephenson, Blake, & Co.

What is even worse than this is that some names are used by different founders to indicate totally different kinds of letters. Thus the “Doric” of Miller & Richard is an ornamental letter, while the “Doric” of Caslon & Co. is a square sanserif! The want of uniformity of nomenclature in types is seriously embarrassing, for a name quoted often fails to indicate the kind of face, the speaker or writer meaning one kind and the hearer or reader understanding quite another.

Two-colour Letters.—A few kinds of letters, mainly Ornamental Initials—that is, letters which commence chapters in books—are in two parts for different colours, the one part consisting of the ornamentation, and the other of the letter itself. These are called *Two-colour letters* :—



The type to the left hand, with the A in outline, is printed along with the text, and then the letter to the right is printed in another colour so as to fill the outline of the A. Several comparatively plain founts are now cast for two colours, one to outline the other.

CHAPTER VI.

TYPES (*continued*).—Bodies and their Relations to one Another—the Present Diversities—Attempt at Uniformity—the Point System—Height of Types—Type Metal—Weight—How Type is Sold—Qualities of Good Type.

Relative Sizes of different Bodies.—The names given to the various bodies of type are stated on pages 54 and 56. Unfortunately, there is no standard for type bodies common to all the founders. The reader would naturally think that “brevier” meant a type of a certain definite depth or body from whatever founder it might come. This, however, is by no means the case, and indeed until quite recently no three British founders’ breviers were of the same depth.

Theoretically, pica was always one-sixth of an inch in depth, but even this did not hold true. Some founders’ pica was slightly less and that of other founders was slightly more than the sixth of an inch, and none would adopt the standards of the others. Indeed, the founders seemed to pride themselves on having each his own standard, and they esteemed the fact a commercial advantage on their side. However this may have been, the want of uniformity has caused great inconvenience and expense to printers, for, among other things, each founder’s letter has had to be worked with that founder’s spaces and quads, and it has often been found very difficult to work in one fancy type with another. Happily, of late steps have been taken to abolish this diversity, and before long it is likely that there will be

absolute uniformity. This is due to the initiative of the American printers and founders, who have devised what is known as the *Point System*—a system which has now been accepted by all the chief British type-founders, though it is naturally only gradually replacing the old standards.

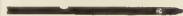
The Point System.—In this system the Pica em measures one-sixth of an inch,¹ and it is divided into twelve parts or “points,” so that a point is one seventy-second part of an inch; and every type body, rule, lead, quotation, and piece of furniture is some multiple of a point, as may be seen from the table on the opposite page.

When the Point System was first adopted each size was given a name, and a list of these names, most of them being the British names of types, was given in the last edition of this work. But now, in America, the names have been practically discarded, and bodies are designated by the number of points they measure, *e.g.*, “11-point,” “10-point.” Moreover, though the names Ruby, Pearl, Nonpareil, Brevier, etc., were used, the sizes of the American types often varied much from the sizes of the British types bearing the same names, and none of them were of exactly the same measurement. Indeed, in some cases the names given to the point bodies were very misleading to Englishmen. For instance, the American Ruby was a size less than Diamond, our Ruby being about the size of their Agate; their Double Pica was our Two-line Pica, their Columbian was about the size of our Great Primer, and their Great

¹ In the Point system the Pica em is not, as is commonly supposed, exactly one-sixth of an inch; it is fractionally less, so that 72·2081 ems go to the foot. The founders of the system inform the Editor that 83 of their Pica ems measure 35 centimetres, or, in other words, their standard Pica em measures the 83rd part of 350 millimetres, that being the nearest fraction of an integral number of millimetres to correspond with one-sixth of an inch. For all practical purposes this is one-sixth of an inch.

Type Bodies, Illustrating the American Point System.

3 POINT.



3½ POINT.



4 POINT.



4½ POINT.



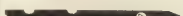
5 POINT.



5½ POINT.



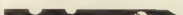
6 POINT.



7 POINT.



8 POINT.



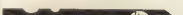
9 POINT.



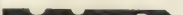
10 POINT.



11 POINT.



12 POINT.



14 POINT.



15 POINT.



16 POINT.



18 POINT.



20 POINT.



22 POINT.



24 POINT.



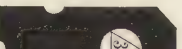
28 POINT.



30 POINT.



32 POINT.



36 POINT.



40 POINT.



42 POINT.



44 POINT.



48 POINT.



60 POINT.



72 POINT.



Primer some two points larger. We therefore omit the American names here, and append a table showing how the point bodies compare with the bodies of the British Founders.

COMPARISON OF POINT BODIES AND OLD BRITISH BODIES.

Points.		Points.	
1	is 12-to-Pica.	11	is larger than our Small Pica.
$1\frac{1}{2}$	„ 8-to-Pica.	12	„ Pica.
2	„ 6-to-Pica.	14	„ larger than our English.
3	„ 4-to-Pica or Semi-Nonpareil.	16	„ smaller than our Great Primer.
$3\frac{1}{2}$	„ less than our Brilliant.	18	„ 3-line Nonp., larger than our Great Primer.
4	„ „ „ „ Diamond.	20	„ smaller than our Double Pica.
$4\frac{1}{2}$	„ „ „ „ Pearl.	22	„ larger than our Double Pica.
5	„ „ „ „ Ruby.	24	„ Two-line Pica.
6	„ Nonpareil.	36	„ Three-line Pica.
7	„ less than our Minion.	48	„ Four-line Pica.
8	„ larger than our Brevier.	60	„ Five-line Pica.
9	„ larger than our Bourgeois.		
10	„ larger than our Long Primer.		

It is to be noted that in the Point System the sizes rise half a point at a time to 5 points, then 1 point to 16 points, then 2 points to 24 points, and after 48 points the rise is 12 points (a pica) at a time.

The experienced compositor will see that all sizes of type from Nonpareil upwards cast on the Point System can be justified one with another by the use of ordinary leads. Thus 9-point (Bourgeois) can be justified with 12-point (Pica) by using a 3-point (4-to-pica) lead; 7-point (Minion) can be justified with 9-point (Bourgeois) by using a 2-point (6-to-pica) lead, and any body can be justified with a body one point larger by the use of a 1-point (12-to-pica) lead. Such types as Diamond ($4\frac{1}{2}$ points) and Ruby ($5\frac{1}{2}$ points) can be justified with Nonpareil (6 points) and Minion (7 points) respectively by the use of a $1\frac{1}{2}$ -point (8-to-pica) lead. Leads, clumps, metal furniture, and brass rule also being made to the same system throughout, a job that with the

old irregular bodies would have been considered well-nigh impossible is now rendered comparatively easy to execute.

How great were the divergencies of the bodies of the different British founders¹ may be gathered from the fact that of PICA, Brevier, and Pearl (to take three bodies out of several) the number of ems to the foot of twelve inches was as follows: PICA: Caslon, 71·8, Miller & Richard, 71·5, Figgins, 71·6, Stephenson, Blake, & Co., 72·2, Reed & Sons, 71·6, Shanks, 71·5. BREVIER: Caslon, 111·1, Miller & Richard, 111, Figgins, 108·5, Stephenson, Blake, & Co., 110, Reed & Sons, 112, Shanks, 110·75. PEARL: Caslon, 179, Miller & Richard, 178, Figgins, 183, Stephenson, 178, Reed, 184, Shanks, 180. Hence with the letters or other characters of any founder it was always necessary to use spaces and quads cast by that founder, and it was often difficult, and sometimes impossible, to use in one piece of work types from different foundries. This is not so with types cast to "point" bodies, for here the standard is uniform, and we are glad to be able to say that all the British founders now cast their types to point bodies and call them "7-point," "10-point," etc., discarding size names—though in most cases they also cast them to their own old standards for the convenience of those who wish to adhere to these standards. Hence, in ordering type now it is desirable to state whether the body required is a point body or one of the old bodies; but no printer who gets type for

¹ The leading British type-founders are Messrs. H. W. Caslon & Co., who are the oldest, Messrs. V. & J. Figgins, Messrs. Stephenson, Blake, & Co., Messrs. Miller & Richard, Sir Charles Reed & Sons, Messrs. P. M. Shanks & Sons, and Messrs. Haddon & Co. The five first named have been longest established, and they are bound by a mutual compact regulating prices and some other matters; hence they are sometimes referred to collectively as "the associated founders."

the first time, and knows his business, dreams of getting any but what is cast to point bodies.

For various purposes it is useful to know the relative sizes of types, and until the Point System shall have become universal we can only advise the learner to commit to memory the Table of Point Bodies on page 68, and also the following Table, which is based on an average, and gives as nearly as possible the number of Ems to the Foot of the various bodies of book types generally used :—

AVERAGE NUMBER OF EMS TO THE FOOT.

OLD BRITISH BODIES.

	Ems to the Foot.		Ems to the Foot.
Pica - - - - -	72	Nonpareil - - - - -	144
Small Pica - - - - -	83	Ruby - - - - -	166
Long Primer - - - - -	90	Pearl - - - - -	180
Bourgeois - - - - -	102	Diamond - - - - -	204
Brevier - - - - -	111	Gem - - - - -	222
Minion - - - - -	122	Brilliant - - - - -	238

By dividing by 12 the number of ems to the inch is readily arrived at, *viz.*, Pica 6, Small Pica 7, Long Primer $7\frac{1}{2}$, Bourgeois $8\frac{1}{2}$, Brevier $9\frac{1}{4}$, Minion 10, Nonpareil 12, Ruby 14, Pearl 15, Diamond 17, Gem $18\frac{1}{2}$, Brilliant 20.

In any case, it must be constantly borne in mind that the Pica em (12 points) measures one-sixth of an inch ; for the Pica em is the chief unit of measurement in compositors' work.

Relative Spaces occupied by Types.—The use of the table of ems to the foot will be seen when such problems as the following have to be solved :—

Problem 1.—A book set in Small Pica makes 500 pages : How many will it make if set in Long Primer ?

Turning to the Table, we see that 90 ems Long Primer and 83 ems Small Pica go to the foot ; these are the bases respectively of the first and second terms in the proportion sum ; but as we are

dealing not with linear measures but with superficial areas, these figures must be squared, thus :—

$$90 \times 90 : 83 \times 83 :: 500 : x.$$

Now, 83 multiplied by 83 comes to 6,889; this multiplied by 500 comes to 3,444,500, and this divided by 8,100 (which is 90×90) gives $425\frac{20}{1}$ (426) pages, which is the answer required.¹

Problem 2.—A book set in Small Pica 21 ems (pica) wide, 36 lines to the page,² occupies 600 pages: If the same should be set in Brevier 18 ems (pica) wide, 45 lines³ to the page, how many pages will it make?

We remember (from the table on p. 70) that 83 ems Small Pica and 111 ems Brevier go to the foot, therefore we have this compound proportion sum to do :—

$$\begin{array}{lcl} 111 \text{ ems} & : & 83 \text{ ems} \\ 45 \text{ lines} & : & 36 \text{ lines} \\ 18 \text{ ems Pica} & : & 21 \text{ ems Pica} \end{array} \left. \vphantom{\begin{array}{l} 111 \text{ ems} \\ 45 \text{ lines} \\ 18 \text{ ems Pica} \end{array}} \right\} : : 600 \text{ pages} : x \text{ pages}.$$

Here we have to multiply together $600 \times 21 \times 36 \times 83$, and divide the product by $111 \times 45 \times 18$. The result is 419 pages. *Ans.*

But in all these cases we can only get an approximate result, first, because of the variations in the body standards of the different founders (this element will be eliminated when the Point System is adopted), and secondly, because types vary not only in body, or depth, but in width, some being bold or extended, and others lean or condensed. Reference to any type-founder's specimen book will show this, some of the founders having, for instance, ten or twelve kinds of Brevier. It is obvious that the above proportion sums hold good only when the two founts considered are proportionate as regards width, or, in other words, "are of the same series;" for if the type in which the book is to be set is of a bolder face than that in which it has been set, it will make more pages than those given above, and if it is of a leaner face it will make less.

If we were to work out these two problems on the Point System, we should proceed thus :—

To solve Problem 1, we should remember that Small Pica in the

¹ In the Appendix is a table which facilitates calculations of this kind.

² This book would (obviously to a practical man) be "leaded," but it makes no difference to the calculation.

³ This book would also obviously be "solid," but this again makes no difference.

Point System is 11 points, and Long Primer 10 points. Squaring these two numbers, we set the sum down thus :

$$11 \times 11 : 10 \times 10 :: 500 : x,$$

$$\text{or } x = 500 \times 100 \div 121,$$

i.e., $x = 50,000$ divided by 121 or $413\frac{27}{121}$ (414) pages. *Ans.*

To solve Problem 2, we should remember that in the Point System Small Pica is 11 points and Brevier 8 points, and should state our proportion sum thus :—

$$\left. \begin{array}{ll} 11 \text{ points} & : \quad 8 \text{ points} \\ 45 \text{ lines} & : \quad 36 \text{ lines} \\ 18 \text{ ems Pica} & : \quad 21 \text{ ems Pica} \end{array} \right\} :: 600 \text{ pages} : x \text{ pages},$$

and should multiply $600 \times 8 \times 36 \times 21$, and divide the product by $11 \times 45 \times 18$. The result is $407\frac{3}{11}$. *Ans.*

The discrepancy between these results and those above given is accounted for by the fact that Small Pica, Long Primer, and Brevier on the Point System are different from the bodies of these names according to the old British systems. Compare the table on page 68.

Relation of Sizes.—Questions similar to the following may arise. Taking the body of Pica type as the standard and calling it 12, what are the relative depths of Small Pica, Long Primer, Bourgeois, Brevier, Minion, and Nonpareil? The method of working out such a question is by simple proportion. We find by the table on page 70 that of Small Pica 83 lines go to the foot, and of Pica 72; hence—

$$83 : 72 :: 12 : x \text{ (the relative length of Small Pica).}$$

So if we want to compare Long Primer with Pica on the same basis we put—

$$90 : 72 :: 12 : x \text{ (the relative length of Long Primer).}$$

The first sum works out at 10 and four-tenths (10·4), the second at 9·6.

If the Point System were universal we should have no proportion sum to do, for we should instantly remember that Pica was 12 points, Small Pica 11, and Long Primer 10.

In France, as also in Germany, Spain, Italy, Greece, Russia, and Holland, the *Didot System*, so called from its inventor François Ambroise Didot, is adopted. The “Cicero” was taken as the basis, and it was divided into 12 typographical points. Cicero is a little larger than our Pica, and 798 Didot typographical points are equal

to 300 millimetres; therefore the Didot point is 376 millimetres, and is slightly larger than the American point, which measures 352 millimetres.

Didot Points.	French Name.	German Name.	Equiv. in American Points.	Nearest English Bodies.
5 -	Parisienne -	Perl -	5·3 -	Ruby.
6 -	Nonpareille -	Nonpareille -	6·4 -	Emerald.
7 -	Mignonne -	Kolonel -	7·5 -	Brevier.
8 -	Petit -	Petit -	8·5 -	Bourgeois.
9 -	Petit Romain -	Bourgeois -	9·6 -	Long Primer.
10 -	Philosophie -	Korpus -	10·7 -	Small Pica.
12 -	Cicero -	Cicero -	12·8 -	Pica.
14 -	Gros-texte -	Mittel -	15·0 -	2-line Brevier.
16 -	Tertia -	Tertia -	17·1 -	Great Primer.
18 -	Petit Paragon -	1½ Cicero -	19·2 -	2-line Long Primer.
20 -	Text -	Text -	21·4 -	2-line Sm. Pica.
24 -	Palestine -	2 Cicero -	25·6 -	2-line Pica.
28 -	2 Texte -	Doppelmittel -	29·9 -	2-line English.
30 -	2½ Cicero -	2½ Cicero -	32·0 -	3-line Sm. Pica.
32 -	2 Tertia -	Doppeltertia -	34·2 -	2-line Great Primer.
36 -	Petit Canon -	Kleine Kanon -	38·5 -	3-line Pica.
42 -	Gros Canon -	Grosse Kanon -	44·9 -	4-line Sm. Pica.
48 -	Missal -	Missal -	51·2 -	5-line Sm. Pica.
54 -	Gros Missal -	Grosse Missal -	57·6 -	5-line Pica.

The names are seldom used, the size of the type being sufficiently indicated by its number. The types most commonly used for book work are those of 6, 7, 8, 9, 10, 12 points.

German types exported to England are generally cast to American bodies.

Height of Types.—Types, of whatever size or body, should always be of the same height, for otherwise some would print and others would not. The standard height for types in this country is $\frac{29}{32}$ of an inch (or the height of a shilling piece standing on its edge), but in some few offices, such as the Clarendon Press, Oxford, different heights will be found. The height of types is sometimes called their “height to paper.”¹

¹ There is a diversity in this respect also among English foundries, whose founts when tried with a fine mathematical gauge are found to vary perceptibly. The mean is generally (in ordinary fractions) $\frac{29}{32}$ of an inch, and it is only in very exceptional offices that types of any other height will be found. Some printers, however, adopt the

Types which are below the surrounding ones are said to be "low to paper," and should be extracted, as they will not give a good impression. Sorts to match an old fount, however, are sometimes purposely cast low to paper.

Spaces and quadrats are usually three-fourths of an inch in height.¹

Type Metal.—The metal in which types are cast is an alloy, generally of lead, antimony, and tin. The proportions vary, each founder having his own recipe; but the following may be taken as an average: Lead 100 parts (by weight), antimony 35 parts, tin 15 parts. A little copper is sometimes added. The lead is the basis of type metal; it is used because it is easily fused and cast, combines readily with the other ingredients, and is cheap; the antimony gives the lead hardness and sharpness, and the tin hardness and toughness.

Weight of Type.—The weight of a square inch of ordinary book types is about 4 oz., but it varies according to the kind of metal of which the type is composed. Hence a pound of some founders' type may contain many more distinct letters than a pound of that of others.²

old Scotch height, which is about $\frac{1}{100}$ of an inch higher. At the Clarendon Press, Oxford, types of one height are used at the "Bible" side and of another at the "Classical" side of the establishment. This is to prevent one side borrowing from the other. The French height is $\frac{1}{100}$ higher than the Scotch, or $\frac{1}{50}$ higher than the English. The difference among German type is great; the leading foundry at Frankfurt adopts a height of about $\frac{1}{5}$ of an inch, which is a little above that of the Scotch, though the German type and borders sent to England are of English height. Russian and some other Continental types are higher than the Scotch or German. For use in the fudge-boxes of newspaper machines type shorter than usual is cast.

¹"High spaces," used in formes to be electrotyped (as will be explained hereafter), are about five-sixths of an inch in height.

²A single pound weight of the letter i in Diamond includes 2,800 different letters; and in the same fount about 5,000 hair spaces go to the pound.

A rough and ready way to *estimate the weight of type required* for a job is to take the area in square inches and divide by 4. This gives the result in lb. It is always necessary to add from 30 to 50 per cent. for "dead letter," *i.e.*, sorts left in the case after the job is finished.

EXAMPLE.—For instance, to find out how much type will be wanted for a book of 100 pages, each page of type measuring 5 inches by 4 inches, multiply 5 by 4, result 20 (square inches) = area of each page; multiply this by the number of pages (100), result 2,000 = total area; divide by 4, result 500 (lb.) = the weight in the 100 pages. Add 50 per cent., or 250 lb., and the result is the quantity to be ordered, *viz.*, 750 lb.¹

How Type is Sold.—Type is sent out from most foundries in parcels, the types being duly composed into lines, and the whole secured by string. The parcel is called a *page* by the foundry, whatever its size. The ordinary size in the English foundries is 6 inches long and $3\frac{1}{2}$ inches wide; in the Scotch foundries it is $6\frac{1}{4}$ by 4. The letter m comes first, then a, b, and the rest of the fount. On the outside is written the designation of the fount, such as "Long Primer, No. 12" (corresponding to the number in the type-founder's specimen book). Some foundrymen put each character or "sort" into a little box by itself.

Types are sold by weight, the price varying according to the size. Thus, a small fount of Pica will cost about 1s. 3d. per lb., and the other bodies will increase in price in-

¹ Another and more accurate rule is this: Divide the area of the page expressed in Pica ems by 140. The answer gives the number of lb. weight in the page.

EXAMPLE.—I have to set 50 pages of Brevier octavo, the size of the page in Pica ems being 20×34 . What fount of type should I order?

The area of each page is 20×34 , or 680 ems Pica; divide by 140 and multiply by the number of pages (50). The result is 243 nearly. Add 40 per cent. and the sum will be 340 lb. *Ans.*

versely to their size, thus : Long Primer, 1s. 6d. ; Bourgeois, 1s. 8d. ; Brevier, 1s. 9d. ; Minion, 1s. 10d. ; Emerald, 2s. 2d. ; Nonpareil, 2s. 7d. ; Ruby, 3s. ; Pearl, 4s. ; Diamond, 7s. ; Brilliant, 12s.¹

Sometimes, however, type is sold by the fount, especially in America. This applies chiefly to jobbing types. The fount is gauged by the number of the letters A and a in it, the number of the other letters being proportionate. Thus, a 14 A and 20 a fount of Pica letter is sold for \$2.75.

In ordering type it is necessary to state whether or not the fount is to contain italic, fractions, leaders, or commercial marks. In ordering sorts to match type already in the office, state the type-founder's number of the face, as well as the size of the body ; or if this cannot be done send a capital H or lower case m, as little used as possible, of the fount the sorts are to work with. State also the number of pounds or ounces required of each particular sort. Job founts (except scripts) are put up without spaces and quads ; therefore spaces and quads should be specially ordered with these if wanted.

Qualities of Types.—The chief qualities which constitute good type are :—

- (a) The quality of the metal of which it is made.
- (b) Its smoothness, sharpness of angle, and perfection of finish. A line of types, when viewed along the back, should present the appearance of a solid bar of metal, and a series should be capable of being taken up between the fingers as if the types were cemented together.
- (c) Sufficient depth of face, and the clean formation of the feet and groove.

¹ See note on p. 51 for comparative weights of the same number of types of different bodies.

- (d) Accurate range with all the other letters of the same fount,¹ both in height to paper, and width and depth of body.
- (e) Strength of part supporting the kern, which is liable to be broken off.
- (f) The character of the design of the face, including *regularity of gauge*,² *exactness in lining*³ and *setting*,⁴ *evenness in colour*, and due apportionment of space to the *counter*, producing an harmonious general effect in the impression.

Type-founding.—It is well for the printer to know how types are manufactured; we will therefore give a short outline of the process, with remarks upon it.

¹ Uniformity in the dimensions of the body of a type is imperative, for by it only can a true alignment be obtained.

² The *gauge* of a letter is its depth of face, measured from top to bottom; thus, the gauge of the annexed letter H is the length of its upright stroke. Letters of the same fount whose depth of face is less than it should be, are said to be *small in gauge*. Those which are set lower on the body than the others are said to be *low in line*.

³ The *lining* of a fount is called by founders the bringing of the top and bottom lines on the face of the letter into such perfect straightness or squareness with the shank of the type, that the whole of the top lines, when the types are put together, shall form one regular line, and the bottom the same.

⁴ The *set* of the types signifies the proper position of the letters, with reference to the precise amount of space between each of them. This is regulated by the counter, and in the adjustment of this care is taken that the proper distance is observed between the sides of the letter and the shank, so that when duly arranged with others for printing, the characters in each word may all appear to be equally apart. To meet this in certain founts in such combinations as WAY, where the angular strokes of each letter leave an unusual amount of white when they come together, a system of mortising is adopted, *i.e.*, a section of the shank to the depth of a pica thick space is cut away, allowing the letters to come quite close, thus making the counter much more perfect.

The Metal.—This is, as we have said, an alloy, generally of *lead*, *antimony*, and *tin*. Some founders, however, introduce other materials.¹

Lead is the basis of type metal, but without other ingredients it is too soft to impart the requisite strength and sharpness to the types.

Antimony gives the requisite hardness and sharpness. It also fulfils another service, for it expands somewhat in cooling, whereas lead contracts considerably; the antimony, therefore, within certain limits, compensates for the contraction, causing the alloy to retain the full size of the mould, and further tending to make the letters sharp.

Tin contributes additional hardness, strength, and toughness, and a finer grain to the whole, by causing them to become more intimately incorporated one with another, and thus uniting them into one compact and durable alloy.

The *essential qualities* of a good type metal are: (a) hardness; (b) toughness; (c) capability to take a fine and clean-cut impression from the mould; (d) complete homogeneousness, with an absence of soft parts; (e) fusibility at a temperature not higher than that which the mould will bear.

Proportions.—There are several distinct kinds of type metal used in the trade, each differing in its degree of hardness. The softest metal is used for casting leads, clumps, quotations, and the like; the intermediate grade for the larger, and the hardest for the smallest letters.

Each founder has his own formula for mixing the alloy, varying to some extent from the standard given on page 74. *Copper* is added by some, especially by American firms, but there are objections to it. In the first place it flows badly when fused, and in the next it often separates from the

¹ See discussion on constituents of type metal at meeting of Society of Arts, 19th March, 1873, reported in *Journal of the Society of Arts*, vol. xxi., p. 332, etc.

other ingredients. If too much of it is in the type a chemical reaction will be set up between it and some of the printing inks used, notably vermillion. *Iron* is not used. *Zinc* has been tried and abandoned, because types made of it oxidise when kept in a damp place, and become cemented together when set up in a page.

The *kind* of lead is "tea lead," which is the lining of tea chests imported from China. It is purer than the bar lead and cheaper, and has a considerable quantity of tin in the solder. The tin is the kind called "block tin," and comes from Truro in ingots. The antimony (which foundrymen call by the old name of "regulus," introduced by the alchemists to denote the reguline or metallic form of any body) is supplied to the foundries in the thick crystalline plates in which it is cast.

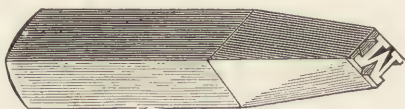
In the *compounding* of the type metal alloy, the lead and tin are first put into the cauldron, both being introduced together. When these have been melted down and duly incorporated, pieces of the antimony from one to two inches square are thrown into the vessel, whereupon the heat is considerably raised; owing to the antimony being far less fusible than the others, it takes some four hours before the lumps become perfectly liquefied and blended with the molten lead and tin.¹ Finally the whole is well stirred, so as thoroughly to combine each with the other, and then the contents of the molten metallic pool are ready to be run into moulds for future use.² The Americans reverse

¹ Tin melts at 442°, lead at 612°, antimony at 810°.

² Since the introduction of the electrotyping process, several suggestions have been made as to the feasibility of obtaining a superior degree of hardness by deposition on the face of the type of a film of some hard metal, such as copper. The faces only of the letters, of course, are so coated, and not the spaces and quadrats. The necessity for any greater hardness than that of the ordinary types is now largely obviated by the use of stereotyping. The *cast* of the types is printed from, not the types themselves.

this method of compounding. By them the antimony is melted first; then the temperature is lowered and the lead and tin are introduced, thus avoiding loss by evaporation as in our method.

The first step in the making of type is cutting the letter desired on the end of a piece of fine steel, forming the *punch*, which is afterwards hardened. This is an operation requiring great care and nicety—there being comparatively few adepts at it—that the various sorts in a fount may be



PUNCH.

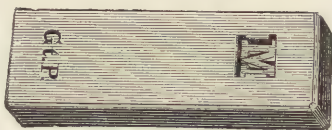
exactly uniform in their width, height, and general proportions to each other. A separate punch is required for each character in every fount of type, and the making of them is the most expensive portion of type-founding. During the process of its manufacture the punch is frequently tested or measured by delicate gauges, to ensure its accuracy. When finished, a smoke-proof is taken, the punch being held over a light, the flame of which blackens the letter, and thus enables an impression to be stamped on the paper.



DRIVE.

When the letter is pronounced perfect, it is driven into a piece of polished copper, which is then called the *drive* or

strike. This passes to the justifier, who makes the width and depth of the faces of the types uniform throughout the fount. They must then be made to line exactly with each other. When thus completed, the *strike* becomes the *matrix*, wherein the face of the type is made. This under-

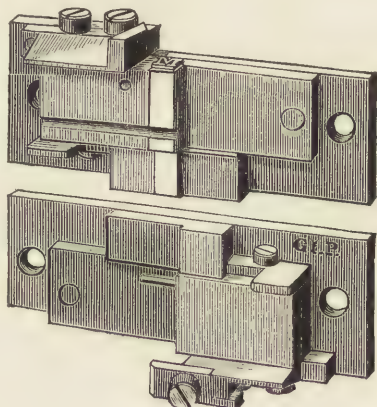


MATRIX.

goes other processes in fitting and finishing, to make it true and square with the body of the type.

The capital letters M and O of each fount are cut first, and they form the basis for the remainder of the alphabet, in depth of face, width of counter, depth of beard, etc.

The *mould*, in which the body is formed, is made of hardened steel, in two parts; one part is fastened to the

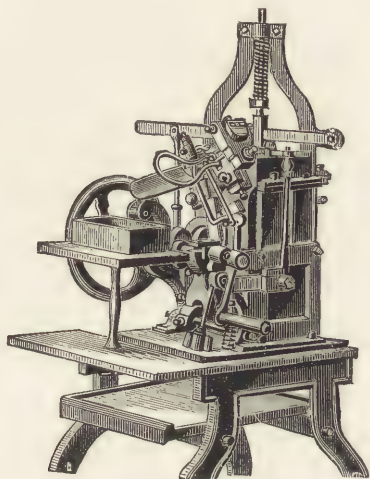


MOULD.

machine, and is stationary, while the other is movable, so that it may be adjusted for the proper width of the letters,

as one is wider than another. The need for accuracy in these moulds is patent to every printer, who knows that types must be mathematically square, else they could not be used.

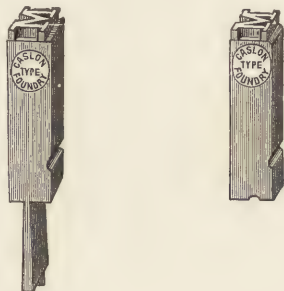
The combined matrix and mould are then adjusted to the *type-casting machine*, which is set at work manufacturing



TYPE-CASTING MACHINE.

types at the rate of from twenty-five to about one hundred and twenty per minute according to the body. The casting of small bodies requires less time than large ones, as the cooling is much more rapid. "The metal is kept fluid by a little furnace underneath, and is injected into the mould by a pump, the spout of which is in front of the metal-pot. The mould is movable, and at every revolution of the wheel it comes up to the spout, receives a charge of metal, and flies back with a fully-formed type in its bosom; the upper half of the mould lifts and out jumps a type. By an ingenious contrivance a small stream of cold water is made

to continually pass at the back of the mould, otherwise it would become so hot that the newly-formed type could not cool soon enough to be jerked out. The spring in front holds in close proximity to the mould a copper matrix, such as has been described. The letter *a*, for instance, stamped in the matrix, sits directly opposite the aperture in the mould which meets the spout in the pump; and when a due proportion of *a*'s is cast, another matrix, with *b* stamped in it, takes its place, and so on throughout the



TYPE WITH JET AND WITH FEET FORMED.

whole alphabet." In casting small founts, where frequent changes are made in the moulds, the machines are driven by hand power; but when the founts are large, as in daily newspapers, steam is used as a motor, and the industrious little machines, with scarcely less than human intelligence, go thumping along at their work, requiring but little care or attention, except when changes in the matrices and moulds become necessary.

Letters without kerns are cast perfect in the present machines, the jet being broken off and the feet formed. In the kerned and italic letters a *burr* still adheres to the shoulder of the type, and is taken off by the *rubbers*, who rub the sides of the letters on circular stones or "laps," or upon fine steel files manufactured expressly for this purpose. The kerned letters are then dressed without disturb-

ing the kern or overhanging part of the type. The types next go to the *setters*, who set them in long lines ready for the *dresser*, who slips them into a long stick, turns them on their face, fastens them in a bench adapted for that purpose, and with a plane cuts a groove in the bottom, taking off the burr left in breaking off the jet, leaving each type with a pair of feet to stand upon, and then dresses off the under and upper sides, giving them the bright silvery appearance so familiar in unused type.

The *picker* now takes the lines of types in hand, and, with the aid of a magnifying glass, picks out each defective letter. They are then broken up into shorter lines, for convenience in handling, when they are sent to the warehouse, where they are divided into founts, each having its due proportion of the respective sorts, made into pages, wrapped in paper, sent to the office, packed, marked, and despatched to the purchaser, or put upon shelves awaiting an order.

The following is a recapitulation : The various operations of type-founding may be enumerated as follows : 1, Punch Cutting. 2, Matrix Making—(a) milling, (b) striking, and (c) justifying. 3, Mould Making. 4, Mould Setting. 5, Casting. 6, Breaking off. 7, Setting up for Machine Rubbing. 8, Machine Rubbing. 9, Setting up for Dressing. 10, Dressing. 11, Picking. 12, Telling Down. 13, Paging up. 14, Taking out.

CHAPTER VII.

WOOD TYPE.—Its Advantages and Disadvantages—How Founts of it are made up and sold—How to cut Wood Letter.

Wood Type.—Large letters, used for placards and advertisements, are formed of wood, the face being engraved, sometimes by hand, but now generally by machinery. Such letters range from Four-line Pica upwards to any size required. Even the largest printing machines cannot accommodate single letters of the dimensions now occasionally used, and they are produced in parts, each printed on a separate sheet, the billposter putting them together on the wall on which they are displayed.

The woods used for wood types are chiefly pear wood, rock maple, and box, the last very rarely, on account of its great expense. The types most esteemed are those cut on the end of the grain, as the cut is sharper and the types are better.

The advantages of wood types when large, say above ten-line, over metal types are, among others:—

1. Their comparative cheapness.
2. Their lightness, thereby reducing labour both in setting and handling the complete forme.
3. They are not so liable to receive permanent and irremediable injury by the accidental tap of a shooting stick.
4. A dent or batter made in the face can sometimes be repaired by damping the spot with water and apply-

ing it to a hot plate, the dent being drawn out to the face level.

The advantages of metal types, on the other hand, are :—

1. They give a superior impression.
2. They are more durable.
3. They are more rigid in locking-up.
4. They bear without injury the action of lye and water.
5. They do not warp or shrink, and do not consequently require underlaying and overlaying.¹
6. The letters of each sort, however numerous, are identical with each other. This is not always the case with hand-cut wood type, but machine-cut wood letters are guaranteed uniform.

Some advise that wood letter should not be used under ten-line, and assert that below it such type is dearer than metal, when the value of the latter material is taken into consideration.

Founts of wood letter are cut with lower-case sorts in both modern and old style, and in texts, black letter, and scripts; but many founts, especially those of an ornamental character, have no lower-case sorts.

Wood letter is sold in England² in founts consisting of so many dozen, usually 5½-, 8-, 10-, and 12-dozen if there are caps only. If there are caps and lower case, 11 dozen is usually the smallest fount. Figures usually make 2½ dozen, though

¹ Underlaying means pasting paper or card under the type or parts of it. Overlaying means pasting paper on that part of the platen or cylinder of the press which is to impress it.

² American wood type is made up into founts according to the number of A's, the following being a scale of three founts, with their respective number of pieces :—

	3-A Fount.	4-A Fount.	5-A Fount.
Capitals	- 75	- 106	- 120
Lower case	- 65	- 90	- 104
Figures	- 26	- 26	- 26

2 dozen can be obtained. Each point, or stop, counts as half a piece.

Much variety of opinion exists as to the assortment of founts in wood letters, and many printers prefer to order according to their own scheme of proportions. The following are the assortments adopted by some of the leading houses, and they have been found, after many years' experience, the best that can be devised for general posting bill work:—

5½-doz. Fount of Capitals.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z , ; . - ' ? !
3 2 2 2 4 2 2 2 3 2 2 3 2 3 3 2 1 3 3 3 2 2 2 1 2 1 3 1 1 3 1 1 1 3

8-doz. Fount of Capitals.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z Æ & , ; . - ' ? !
4 3 3 3 5 3 3 3 4 2 2 4 3 4 4 3 2 4 4 4 3 3 3 2 3 2 1 1 2 3 1 2 4 2 2 1 3

12-doz. Fount of Capitals.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z Æ & , ; . - ' ? !
7 5 5 5 8 5 5 5 7 3 3 6 5 6 7 5 2 6 6 6 5 3 4 2 5 2 1 1 2 5 2 2 5 2 3 1 4

The addition of figures makes $2\frac{1}{2}$ dozen extra, thus:—

1 2 3 4 5 6 7 8 9 0 £
4 4 4 2 2 2 2 2 2 4 2

An 11-dozen fount of capitals and lower case consists of the above $5\frac{1}{2}$ -dozen assortment, and the following:—

a b c d e f g h i j k l m n o p q r s t u v w x y z fi ff fl ffi
4 2 2 2 4 2 2 2 4 2 2 3 2 3 4 2 1 4 4 4 3 2 2 1 2 1 1 1 1 1 1 1

with a few extra points.

Multi-Colour Letters.—For various ornamental purposes letters have been designed which may be printed in more than one colour. A red letter, for example, may have a black outline, and a shade in some other colour may be added to it. Each of these colours requires a separate block,

as each has to be printed separately by the method which will be afterwards described.

Letter-cutting.—It is occasionally convenient to a printer who carries on business remote from a large town to be able to augment a fount by single letters, or to cut a line of type in some particular style. This may easily be done by any man possessed of a good eye and a steady hand, if he supply himself with the necessary tools and suitable wood. The printers' joiners sell wood in slips of various sizes and of a thickness equal to type height, ready planed up for this purpose. Should this not be procurable, select a piece of sound pine or deal an inch and a half in thickness, and get it planed to type height at the nearest joiner's shop or saw mill. It is better that the block should be slightly "low to paper" than "high," for it can easily be raised by pasting a piece of card underneath, or, as it is called, being "underlaid." Then finish off the surface with glass-paper, and give it a light wash of whiting or chalk in solution. Draw the letter required on a piece of tissue or tracing paper the way it is to print—not reversed. If you have a printed copy this, of course, will not be necessary. Take a piece of thin carbonic paper, or of tissue paper rubbed over with blacklead or red chalk, and place it with its face to that of the block. Turn the drawing or the impression over, and lay it face downward on the coated paper. Then trace round the outlines with a needle or steel point. Remove the two papers, and the design will be found transferred to the block the reverse way. If another letter is required, repeat the process, taking care that the two letters are close together and perfectly straight on the block. When not required to be reversed, the design may be drawn on a piece of thin paper and pasted down on the wood; the whole may then be cut through with the tool. For cutting large type a knife-tool, chisel, and two or three gouges are requisite. The knife-tool can be made by fixing a graver in a straight handle, similar to a gouge handle, allowing the edge of the blade to project about an inch. Then sharpen the bevelled part to an edge, so as to make a sharp point to it. The letter must be cut round carefully with the knife. However long the line may be, continue without stopping if possible. When you arrive at a line crossing be careful to stop, or your work will be injured. When curved lines have to be engraved, the right hand and the tool should not move, but the block should, if possible, be turned round. Having gone round the outlines, cut away with a gouge all parts that are not to be black in the impression. In doing so be careful to keep the edge of the letter as sharp and clean as

possible. Work away from the outline, in the direction of the edge of the block, and let the open white spaces be gradually more deeply cut as they recede from the printing portions. If there is a large space, as at the top right-hand corner of the letter L, only half the thickness of the wood should be left. When the black spaces are all neatly carved away, soak the block in linseed oil for a short time. Then cut between the letters with a fine saw, if they are to be separated.

CHAPTER VIII.

COMPOSING ROOM PLANT.—Cases—the Boxes—the Upper and Lower Cases—a Pair of Cases—Double Case—Treble Case—Four-Fount Case—Six-Fount Case—the Half Case—Fount Case.

Cases are the trays in which the smaller kinds of metal types are kept. They are divided by “bars” into compartments, one of which is appropriated to each of the sorts of which the fount consists.

Cases are nearly always made of wood, teak being often considered the best for the purpose. The standard dimensions of full-sized cases are $32\frac{1}{2}$ inches long by $14\frac{1}{2}$ inches broad. Their inside depth is $1\frac{1}{8}$ inch.

The compartments are known as *boxes*, and the case is lined at the bottom with paper, to prevent the face of the type being injured by coming in contact with the wood. At the junction of a number of the bars pins should be driven through them to connect them with the bottom. These are called “pinned cases.” Some are clasped with metal at the junctions to strengthen them. The best made cases are now treble bottomed, that is, the bottoms are composed of two thin layers of wood with a thicker layer between; this is to give strength and prevent warping.

There are two principal kinds of cases, called respectively *upper cases* and *lower cases*. The latter is that which, when placed in position on its proper stand, or “frame,” is nearest to the body of the workman, and the upper case is higher up, or farther removed from him.

The upper case contains principally the capital and small capital letters, and the lower case the small letters. Hence

capitals are called "upper-case sorts," and small letters "lower-case sorts."

The *upper case* consists of 98 equal-sized boxes.



UPPER CASE.

The *lower case* usually consists of 53 boxes of various sizes as shown in the diagram.



LOWER CASE.

The smallest boxes of the lower case have dimensions slightly less than those of the boxes of the upper case, and the others are multiples of them. There are 26 of the small size ; 12 boxes are twice as large ; 14 four times ; and one six times as large.¹

The reason that some boxes are larger than others is that certain letters of the alphabet, particularly the vowels, are much more frequently used than the others.

An upper and a lower case together are called a *pair of cases*. These contain all, or nearly all, of the sorts that comprise a full fount.

Some founts, however, are deficient of small capitals, and are used in small proportion to Roman text letters. To

¹ When accommodation is required for an extra sort one of the boxes may be divided, diagonally, by inserting a piece of reglet or brass rule.

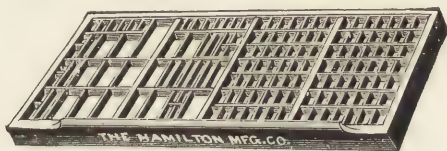
accommodate these founts, *double cases* are made. In their dimensions externally they are the same as ordinary cases, but the arrangement of the boxes is different. They are divided by two stout bars into three equal parts, two of which are allotted to lower-case sorts, and the third to upper-case sorts. There are 53 lower-case boxes, and 49 upper-case boxes—together 102 boxes. The annexed is a view of a double case :—¹



DOUBLE CASE.

This case is sometimes, in that portion devoted to capitals, divided into six rows of boxes instead of seven, as shown above. The seventh row of boxes is not very useful, and its abolition gives greater space for the other boxes, which is regarded as an improvement.

This kind of case is used not only for small italic founts, but for founts of fancy letters which are provided with lower-case letters.



COMPLETE ROMAN CASE.

Double cases can be obtained so divided as to give the same number of boxes as a pair of cases, the left-hand half

¹ Some printers erroneously call a double case a "half case," and thereby cause much trouble to the dealers in such goods, a *half case* being a very different thing (see p. 94).

representing the lower case, and the right-hand the upper. They are called "complete Roman cases." Other double



DOUBLE LOWER CASE.

cases are double lower cases, *i.e.*, they have no upper-case half.

The *treble case* will accommodate *three* founts consisting of capital letters only, or capitals and figures, as may be supplied. It contains 147 boxes.



TREBLE CASE.

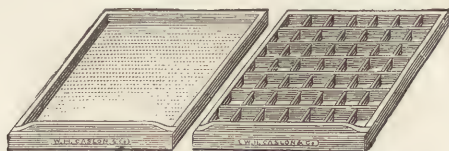
If the boxes are made of the same height as those in the above case, but narrower in width, *four* founts may be accommodated in one case. This *four-fount case* contains 112 boxes.

A modification of the four-fount case contains four complete founts of fancy or capital letters, while the boxes are as large as those of a three-fount case.

If the boxes are made still smaller, the case may be arranged to accommodate *six* founts (but there will be no room left for figures or points in this arrangement). This case contains 168 boxes.

Four- and six-fount cases are not often used, and are not to be recommended, for the boxes are too small to be convenient.

A case is made about half the width of the ordinary upper case to hold capital or fancy letters only, with figures and

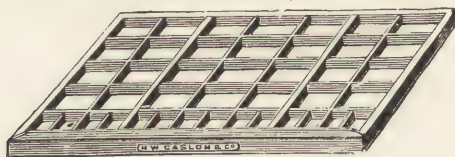


HALF CASES.

points; this is called a *half case*, and is divided into 49 boxes.

Half cases divided in the same manner as lower cases can also be procured. Others have no bars at all, and are useful for the keeping of wood types, etc.

In addition to the above, cases are obtainable with special divisions for jobbing letter. The difference between these and ordinary upper cases is that several of the boxes are twice as large as others.



IMPROVED JOBBING UPPER.

Cases, specially divided, have to be procured for some foreign languages.



SANSPAREIL CASE.

Some cases are made of the same dimensions as upper or lower cases, but with only one (middle) division. They are

for keeping large types in, and are called *sanspareil cases*. Other cases for large types or scripts are divided by movable bars. One kind is shown in the illustration.



CASE FOR LARGE TYPES OR SCRIPTS.

Quarter cases are a modern development. Four of them fit into a tray the same size as an ordinary case, and each of the four is divided into compartments to contain accents, figures, signs, etc. (see illustrations on next page).

Space Cases.—Cases are also made which are intended to accommodate spaces and quads exclusively. They should contain the hair, thin, middle, and thick spaces, and the en, em, and large quads of *eight* or *nine* of the most useful

Hair	Hair	Hair	Hair	Hair	Hair	Hair	Hair	Hair
Thin	Thin	Thin	Thin	Thin	Thin	Thin	Thin	Thin
Mid.	Mid.	Middle	Middle	Middle	Middle	Middle	Middle	Middle
Thk.	Thick	Thick	Thick	Thick	Thick	Thick	Thick	Thick
En Q.	En Q.	En Q.	En Q.	En Q.	En Q.	En Q.	En Q.	En Q.
Em Q.	Em Q.	Em Q.	Em Q.	Em Q.	Em Q.	Em Q.	Em Q.	Em Q.
Q. ls.	Quads.	Quads.	Quads.	Quads.	Quads.	Quads.	Quads.	Quads.
NONPAREIL.	DREVER	LONG PICA	SMALL PICA	PICA	GT. PRIM	DOUBLE PICA	2-LINE ENGLISH	2-LINE GT PRIM

SPACE CASE.

bodies of type. The object is to save the time of the compositor, as it renders unnecessary his walking about the

office to justify lines of fancy type, borders, etc., a matter of consideration nowadays, when so much display composition is necessary. It also tends to prevent the ordinary cases being denuded of spaces and quads.

1	2	3	4	5	á	é	í	ó	ú	à	è	ì	ò	ù
6	7	8	9	0	ä	ë	ï	ö	ü	â	ê	î	ô	û
/	En Quad.	Em Quad.	Mid. Space.	£	Ç	Ñ	ç	â	ñ	õ				
$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{3}$	$\frac{2}{3}$	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{5}{8}$	$\frac{7}{8}$	$\frac{1}{6}$					
1	2	3	4	5										
6	7	8	9	0										

FOUR "QUARTER" CASES IN FULL SIZE BLANK CASE.

1	2	3	4	5	6	7	8	9	0
1	2	3	4	5	6	7	8	9	0
-		En Quad.	Em Quad.	¶	@	lb	%		

FOR SPLIT FRACTIONS AND COMMERCIAL SIGNS.

:	::	∴	∵	÷	±	∫)	√	√
$\sqrt[3]{}$	$\sqrt[4]{}$	□	⊥	Δ	∠	<	°	'	"
+	-	×	÷	=					

FOR MATHEMATICAL SIGNS.

Cases for Rule, Leads, and Metal Furniture.—Cases for storing rule, leads, clumps, and metal furniture are variously divided so as to keep the different lengths and widths distinct,

Fount Cases are upper and lower cases on a large scale; they are chiefly used in large book and newspaper offices, where exceptionally heavy founts of type are required. In some of the older kinds, the upper cases are 39 inches long by $16\frac{1}{2}$ inches broad; and they are divided into 49 boxes for the capitals and figures, with a few odd sorts. The lower cases are also 39 inches by $16\frac{1}{2}$ inches in size; they have the same number of boxes as any ordinary lower case. The boxes in these cases are nearly two inches deep. More recently these cases have been made in two sizes—the larger, $42\frac{1}{2}$ by $18\frac{1}{2}$ by $3\frac{1}{2}$; and the smaller, $32\frac{1}{2}$ by $15\frac{1}{4}$ by $2\frac{1}{2}$. Fount cases are used for storing type, but some prefer the cabinets which are now sold for this purpose.

CHAPTER IX.

COMPOSING ROOM PLANT (*continued*).—Frames—Half, Three-quarter, Whole, and Double Frames—Case-racks—Composing-sticks—Setting-rules—Galleys—Galley Racks—Letter Boards.

Frames, the stands on which cases are arranged in the printing-office, are made of some light kind of wood,¹ of the construction shown in the annexed illustrations.

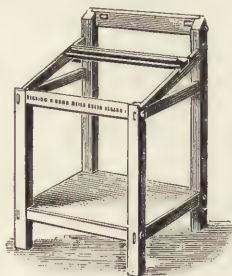
The height of a frame is generally three feet six inches at the front, and four feet six inches at the back.² The cases rest on the sloping parts, the lower case being placed nearest to the front, and the upper case behind it. In this way the upper case is more inclined than the lower, and the

¹ In America frames are called stands, and in the best offices are frequently made of iron. They are generally one inch higher than those in use here. Their names also are different. A single stand is one at which only one compositor can work, while a double stand affords space for two sets of cases and two compositors.

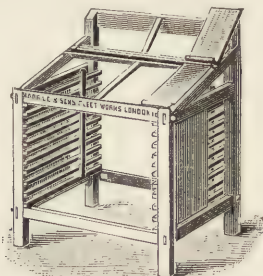
² The height of the frame is a very important matter to the compositor. If too low for his stature, it induces a stooping habit very injurious to health, and if too high it seriously retards the speed of his work. Hansard says that the height of a compositor and his frame should be so adjusted that his right elbow may just clear the front of the lower case by the *a* and *r* boxes, without the smallest elevation of the shoulder-joint, and his breast be opposite the thick space, *h*, and *e* boxes. Most printers think that a frame of this height is the best, both for quickness in composition and the reduction of fatigue to the minimum. A man about 5 feet 6 inches high will find the ordinary frames well adapted for him, but a taller man may elevate the cases by putting others underneath them; and a shorter man may stand on something that will raise him above the floor. Some remarks on the height of frames as conducing to speed in working will be made subsequently, when treating of composition.

boxes are brought nearer to the compositor than if the case were in a more horizontal position.

Frames are of various kinds, *viz.*, half frames, three-quarter frames, whole frames, and double frames.



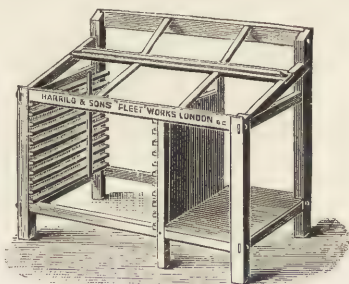
HALF FRAME.



THREE-QUARTER FRAME.

Half frames are about 28 inches wide. They hold one pair of cases only (on the top), but are sometimes fitted below with ledges or racks for half cases.

Three-quarter frames are about 39 inches wide, accommodate one pair of cases in position at the top, and are fitted with a rack underneath, to contain reserve cases.



WHOLE FRAME.

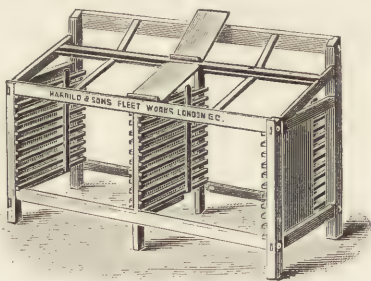
The rack is usually made up of ten ledges, placed two inches apart. The frame thus affords space for five pairs of cases.

Whole frames hold two pairs of cases in position on the

top. They contain a rack underneath for holding five pairs of cases. The remaining space, which may be to the right or to the left, is either open, as in the illustration, or closed and used as a cupboard for the compositor's clothes, food, etc., or is fitted up with drawers for copy, proofs, account books, etc.

Double frames hold two pairs of cases on the top, but are made wider so as to contain two racks underneath, with accommodation together for twenty cases.

Frames of a smaller size than the half frames are made with racks which contain ten of the half cases mentioned

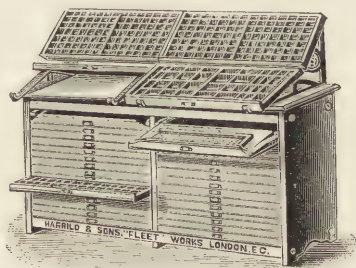


DOUBLE FRAME.

in the last chapter, and two in position on the top. Being only about twenty-two inches wide, they can be placed in a spare corner. Other frames contain the same size of cases, but have small drawers at the side; they hold an ordinary pair of cases on the top.

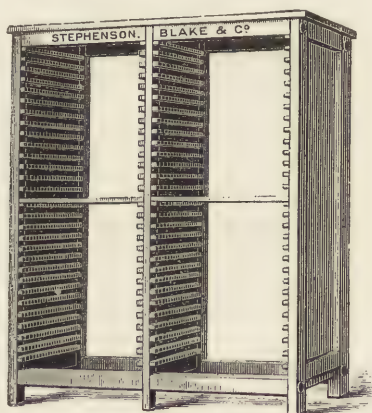
The cases when placed in the racks of the ordinary frames have an open space between them, and this lets in the dust. To prevent this, "dust-proof frames" are now made; that is, the cases and frames are constructed like chests of drawers, or naturalists' cabinets, the top, sides, and back of the frame being boarded in, and the cases fitting tight into the spaces made for them. The cabinets or dust-proof frames will hold more cases than the ordinary

frames, the ledges, or “runners,” being made of thin strips of steel, thus economising space and compensating for their extra cost.



DUST-PROOF FRAME.

The arrangement for sliding in the lower case, as shown in the illustration, is to enable the compositor to correct his galley without blocking half the lower case in so doing, as is done when correcting on ordinary frames.



DOUBLE CASE-RACK.

Case-racks.—Cases for which there is no room in the frame-racks are arranged in stands, called *case-racks*, placed

against the walls of the composing room. Some, called *double case-racks*, hold two tiers of cases side by side.

Bulk.—At the end of the frame, and about three feet from the level of the floor, a flat table is fastened to some of the frames in a bookwork office; this is called a *bulk*. It is intended to hold composed matter.

Composing-sticks.—The instrument in which types, after being taken from the cases, are arranged in lines, or composed, is, as we have seen, called a *composing-stick*. The term is generally abbreviated to “stick;” in some parts of the country it is called a “setting-stick.”

For small types composing-sticks are made of metal, either iron, brass, or gun-metal; for large types, such as those used in placards, composing-sticks are made of mahogany, and have brass or other metal fittings.

The annexed illustration shows the form of the ordinary composing-stick.



SCREW COMPOSING-STICK.

The flat bed of the instrument is called *the plate*. Turned up from this plate at right angles are *the flange* and *the head*, the former being fixed to the long edge of the plate, and the latter to the short edge. The flange is $\frac{5}{8}$ of an inch high, and through it are bored holes, about an inch apart, to receive the screw. The head is of the same height as the flange, but is much stronger, and is securely fastened to it and the plate by rivets, dove-tailing, or brazing. The angular piece, with one side parallel to the head and the other parallel to the flange, is called *the slide*; it has an opening or groove in the part which rests against the flange, and it can be fixed at any distance from the head by the screw and nut, for the groove allows of the slide being moved backward

or forward on the screw and nut, and the screw can be used at the hole convenient to the distance required. This adjustment to the required length of line of the types is called "making the stick up to measure."



THUMB-SCREW COMPOSING-STICKS.

Composing-sticks are made, however, which obviate the necessity of perforating the flange; illustrations of two of the most useful descriptions are here given. In one there is a screw fitting into the slide; in the other there is a thumb-lever instead.

These sticks consist of only three parts, the body (the plate, flange, and head), the slide, and the screw or thumb-lever, and they are more readily adjusted than the ordinary or screw



THUMB-LEVER COMPOSING-STICK.

stick, hence rendering them especially convenient for jobbing¹ or other work of variable measure; but the old screw sticks are generally preferred when very exact adjustment is wanted, or any particular "measure" or length of line has to be preserved for a long time.

Other sticks are made in which the slide is a fixture, and the whole of the parts are in one. These, of course, are only adapted to one particular measure. They are usually made of mahogany, and have a thin lining over the plate and beside the flange and slide, this lining being of gun-metal or

¹ For definitions of "Jobbing," "Book," and "News" Work, see *post*, Chapters 21, 37, and 38.

brass. They are chiefly adapted for newspaper work, or work wherein there is never any alteration of the length of line.

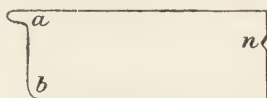
In a good composing-stick, the slide exactly coincides with the head and flange, and when pushed up it will leave no open space whatever in any part. The flange also should be perfectly at right angles to the plate.

Aluminium is probably the best material for a composing-stick, owing to its lightness and non-corrosiveness. Gun-metal and nickel-plated iron are also very good. They are heavier, but stronger than aluminium sticks. Brass is liable to oxidation and iron readily rusts.

The width of the plate of a composing-stick in England and America is about two inches, but on the Continent is much less than that.

The long mahogany sticks used for broadside work are called *broadside sticks*. They have a brass slide; the usual sizes are from 18 to 42 inches long.

Setting-rules.—The thin flat piece of brass or steel called the *setting-rule*, used for facilitating the arrangement of the types in a line, is shaped thus :—



SETTING-RULE.

Its height is the same as that of type, but its length varies according to the length of the line to be set against it. The small projection, marked *a*, is called the *ear*, or *neb*, and by it the rule is lifted out of the stick. The part *b* is curved, and the nick is made on the opposite side to allow of the rule being withdrawn when raised up by *a*. Some printers prefer a setting-rule with a neb and a curve below it at both ends of the rule.¹

¹Sets of setting rules, in sizes as most generally useful, may be had from printers' furnishers. They are often contained in boxes with a sliding lid.

Galleys.—After the type has been composed in the stick it is transferred to *galleys*.

Galleys are thin trays, which on two or three sides are fitted with a flange to support the lines of type. They are of the forms shown in the annexed engravings :—



SLIP GALLEY.

Above is a sketch of an ordinary "*slip*" galley, which is used in book and job work. The short flange is the "head;" the long flanges, the "sides." The height of the flanges is the same as that of the composing-stick.

The annexed is a *job galley*, used chiefly for jobbing work :—



JOBGING GALLEY.

This galley is made in nine or ten various sizes.

Job and slip galleys were formerly made entirely of mahogany; but zinc-bottomed galleys with mahogany zinc-lined flanges, as illustrated, have almost completely superseded the first named. The zinc foundation being much thinner than the wooden bottom is safer when sliding type from the galley on to the stone; it is also better adapted for proofing matter at press prior to being imposed.

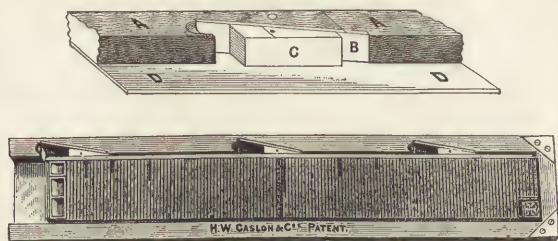
Brass is used for the bottoms and linings of galleys, as well as zinc; the thickness of either is about the sixteenth of an inch.

The newspaper slip or "column galley" differs from the ordinary slip galley only in being larger.

Column galleys are made with either zinc or brass bot-

toms and wooden flanges, or are entirely cast in brass. Those which have wooden sides are sometimes lined at the head and on one or two sides with strips of zinc or brass. They should have metal corner plates. In the best kinds the sides are strongly riveted to the bottoms. The usual width of a column galley is $4\frac{1}{2}$ inches, but "double column" galleys are 7 inches wide inside, and these are mostly used in book work. The length of either varies from 24 to 30 inches, according to choice. In some of the best galleys the sides project a trifle beyond the mouth, so that the projections may rest on the imposing surface when matter is being slid on to it from the galley. For good jobbing work it is very important that the galleys used should be perfectly rigid and true.¹

As matter in galleys has often to be printed from for proofs, it has to be locked up with side-stick and quoins. To economise time and space, "self-locking galleys" have been invented. Below are illustrations of one of the best,



SELF-LOCKING GALLEY.

the merits of which are self-evident. A represents the wooden galley side; B, the fixed part of the metal quoin; C, the metal sliding quoin, and D, the bottom of the galley.

¹ It is usually an improvement to a galley to perforate the bottom near to the head with a hole or two. Type is often wetted on galleys, and the water cannot readily escape, causing considerable inconvenience; whereas, if this plan is adopted the moisture can be got rid of immediately.

Sizes of Galleys.—*Slip galleys* are usually made in four sizes: (a) 21 inches long by 5 inches broad; (b) 18 inches long by 5 inches broad; (c) 24 inches long by 6 inches broad; (d) 18 inches long by 7 inches broad. *Job galleys* have the following names and sizes:—

	Inches.	Inches.		Inches.	Inches.
Demy Octavo -	8½	by 5½	Demy Folio -	18	by 11
Foolscap Quarto -	10	" 7	Royal Folio -	21	" 13
Demy Quarto -	13	" 9	Foolscap Broadside	19	" 12
Royal Quarto -	15	" 10	Crown Broadside -	21	" 14
Crown Folio -	16	" 10			

Column galleys are generally made to these sizes:—

23 by 4¼	23 by 5¼	25 by 6¼	30 by 4¼
25 " 4¼	25 " 5¼	27 " 4¼	

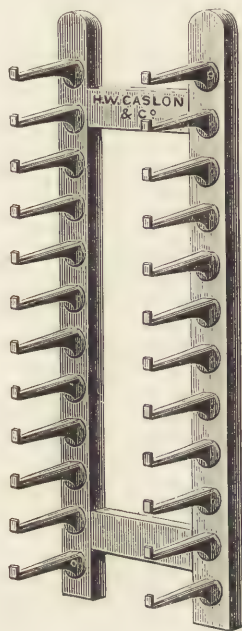
Galley Racks.—Galleys containing type may be stored away in reserve in *galley racks*, constructed as in the following figure, or with two or more rows side by side:—



GALLEY RACK.

For newspaper work, where the galleys are all of the same size, ledges are often substituted for shelves in the galley rack.

Galley racks are sometimes fitted up under composing frames, instead of racks for cases, or under the imposing surface, but it is not a good plan to put them under this, as



WALL BRACKET GALLEY RACK.

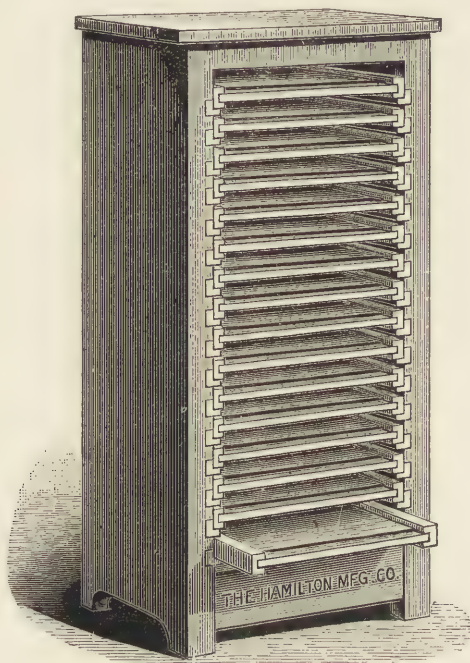
the frequent locking-up of formes may loosen the matter contained in the galleys and cause pie.

An economical arrangement for galleys is to make an internal rack in the back of the frame. A rack the full height of the back of the frame may be conveniently placed *between* two frames, when they are placed back to back.

Most galley racks are made with sloping shelves, so that

the type may rest against the side of the galley that is most depressed.

Galley racks are sometimes formed of brackets hung against a wall, the galleys being lodged upon them lengthwise. This is a favourite plan in America.



BOARD RACK.

Letter Boards.—Composed type matter is sometimes kept on boards, and *board racks* or *bulks* are made to contain them. These are similar to the galley racks, consisting of a series of ledges on which the boards are held, but are much broader. The *letter boards* are simply pieces of planks, truly planed, and clamped together with what

joiners call "rails." A thin sheet of zinc on the upper surface of the board enables the type to be more safely moved about from side to side and slid off and on. They are about one inch in thickness, and are made to various sizes, such as demy, royal, double crown, and double demy.

Sizes of Letter Boards.—The more usual sizes of letter boards are Double Royal (42 by 27 in.), Double Demy (39 by 27), Double Crown (32 by 24), Royal (30 by 24), Demy (26 by 21), and Crown (18 by 13). They are usually sold in pairs.

CHAPTER X.

COMPOSING ROOM PLANT (*continued*).—Leads: Kinds—Weights—Brass Space Lines—Keeping of Leads—Clumps—Reglet—Wood Furniture—Metal Furniture—French and Improved French Furniture—Quotations—Curvilinear Quadrats.

Leads.—When it is necessary to make a wider space between lines of types than is afforded by the shoulder, thin pieces of metal, cast for the purpose, are placed between the lines. These are called *leads* (because lead usually forms their principal ingredient) and *space lines*.

Leads are in height equal to quads, or nearly so. In thickness they vary considerably, but are always cast so as to form aliquot parts of pica body. Four, six, eight, or twelve of them are respectively equal to the thickness of a pica em quadrat, and they receive their names accordingly; thus we have four-to-pica leads, six-to-pica leads, and so on.

In length leads must, of course, be exactly equal to the lines they are intended to space out. As the pica em is the unit of these lines, leads are cut to lengths expressed in pica ems. Thus lengths and bodies are expressed by such phrases as “20-em 6-to-pica leads,” “10-em 4-to-pica leads.”

Leads are now supplied by the founders ready cut up to certain lengths with great accuracy. If printers cut them up themselves they should use a lead or rule cutter (a machine shown on page 128). Leads should not only be exact in length, but uniform in thickness throughout that length. The top and bottom edges should not be sharp, but slightly bevelled off.

The best leads are those which are planed after being cast. They are necessarily much more accurate than the ordinary kind. The top and bottom of such leads are also planed flat, instead of being rounded, as when they come from the mould. This enables them to stand upright by the side of type, even when unsupported, and is a considerable convenience to the compositor.

Weight of Leads.—Leads vary considerably in weight, according to the metal in which they are cast, but for ordinary purposes the following may be taken as facts:—

520 ems of 4-to-pica leads	} weigh 1 lb. ¹
768 „ 6-to-pica „	
1,056 „ 8-to-pica „	

If these figures are committed to memory, it will be easy to calculate at any time what weight of leads will be required for any job. All that has to be done is to multiply the number of leads required by the length of the line of type (or “measure”) in pica ems, and divide by 520, 768, or 1,056, as may be. The result will be the weight of the leads in pounds.

Example: I have to lead (8-to-pica) 8 pages of a work

¹ It might be thought that 4-to-pica leads would be just twice as heavy as 8-to-pica, and that 6-to-pica would be proportional, but it is not so. By actual testing the following results have been obtained: “Premier” (planed) leads: 1,055 ems of 8-to-pica, 818 ems of 6-to-pica, or 521 ems of 4-to-pica go to the lb. Miller & Richard’s leads: 1,148 ems of 8-to-pica, 766 ems of 6-to-pica, or 527 ems of 4-to-pica. Ford’s leads: 1,142 ems of 8-to-pica, 839 ems of 6-to-pica, or 542 ems of 4-to-pica. These figures show, too, how the weights of one make vary from those of another. The table in the text is a compromise, the lowest figures being taken in each case to make sure of being on the right side. The table given in the earlier editions of this work, based on an old calculation (and copied, like many others, into all other publications dealing with the subject), is now shown to be wrong. That table gave 576 ems of 4-to-pica leads, 864 ems of 6-to-pica leads, and 1,152 ems of 8-to-pica leads.

24 ems (pica) wide, 38 lines to the page: What weight of leads will be required? Multiply 38 by 8 (result, 304 = the number of leads required); multiply this by 24 (the width or measure—result, 7,296 = total number of ems); divide by 1,056, result, rather less than 7 lb.—*Ans.*

Brass Space Lines.—Occasionally brass is used instead of lead for the same purposes as leads. Such space lines are useful in newspaper and book offices, for they last long, but they are expensive at the outset. They are 20 per cent. lighter than leads, are usually truer, and are much more durable. Founts of 12-to-pica or “point” space lines in brass are supplied to work with type cast on the point system.

Keeping of Leads.—Leads are stored in the printing office either in drawers, trays, racks, or pigeon-holes. In any case, a separate compartment must be appropriated for each size and description. Drawers are used when a very large quantity of each kind is required.



LEAD AND CLUMP CASE.

Lead Cases, or trays, are similar in dimensions to the ordinary letter cases. They are divided into sections of varying widths by vertical bars. Sanspareil cases may be used for the purpose, and the printer can divide them as he requires with the strips of wood which are supplied for the purpose, or with the ordinary reglet.

As lead cases and racks contain nothing under six ems in length, some convenient place should be provided for the smaller pieces. A shallow drawer may be used, divided for 1, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, and so on, by half ems or ens, up to $5\frac{1}{2}$.

Clumps¹ are cast to the bodies of type ; thus, there are clumps of the thickness of nonpareil, bavier, long primer, pica, etc. ; nonpareil and pica are the sizes most used.

Clumps are sometimes made with letters or words on their upper surface to distinguish the nature of the type matter to which they are applied, or the name of the compositor by whom it has been set up.

Clumps, like space lines, are also made of brass, and these are very much more safe and often more economical in use than the common ones.

Of late clumps have been cast with grooves in them for the reception of the page cord used in tying up matter ; such clumps are called tying-up clumps.

Angle Clumps are also found in some offices. They are L-shaped pieces for putting at the corners of matter, especially matter bordered with rules, which are thereby held in place.

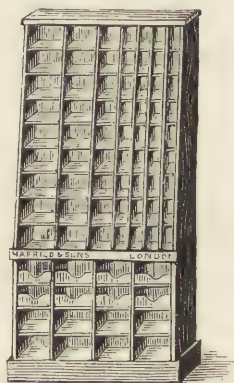
Reglet.—When the lines to be spaced out are very long, such as those of placards, leads cannot be conveniently used, and for this purpose a description of space line called *reglet* is made.

Reglet is always made of hard wood, such as beech or oak, and ought to be of the same height as leads. It is made in *lengths*, each length consisting of three feet, and is sold in “dozens” ; that is, dozens of yard lengths. Its thickness is that of the regular bodies of type ; thus, there are diamond, pearl, nonpareil, minion, bavier, bourgeois, long primer, small pica, pica, English, great primer, double pica, two-line pica, two-line English, and two-line great primer reglet. Some of these sizes, however, are very seldom used, and the presence of all in an office is likely to cause confusion. Nonpareil, pica, and 2-line pica reglet are generally found sufficient.

¹ Clumps are very thick leads ; they are called slugs in America,

Reglet should be of sound, well-seasoned wood, planed true. Cheap reglet is very dear to the printer in the end.

Reglet is generally cut up to the size required by the printer himself, with the aid of a saw. It is much more economical and convenient, however, to get it cut up to em measures by the printer's joiner—a practice which is now usual. It should be kept in a rack.



RACK FOR LEADS, REGLET, OR FURNITURE.


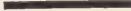

Scaleboard is reglet cut to 4-, 6-, or 8-to-pica bodies. It is not used in good work, leads being far preferable.

Furniture.—Lengths of wood, similar in every respect to reglet, except in their thickness, which is greater, are called *furniture*, or *wood furniture* in contradistinction to metal furniture. This furniture is sold in *lengths* of three feet, and each piece is of the same height as reglet.

The different sizes of wood furniture are :—

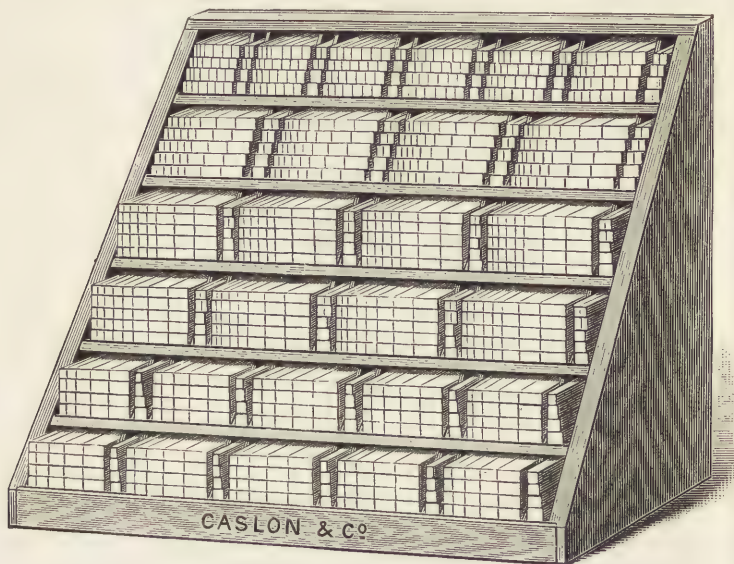
Narrow	-	-	-	3	pica ems in thickness or body.		
Broad	-	-	-	4	"	"	"
Special	-	-	-	5	"	"	"
Double narrow	-	-	-	6	"	"	"
Broad-and-narrow	-	-	-	7	"	"	"
Double broad	-	-	-	8	"	"	"
Double special	-	-	-	10	"	"	"

The following show the exact thicknesses of the different sizes:—

		
DOUBLE NARROW.	BROAD.	NARROW.

Wood furniture, like reglet, is preferably cut up to sizes by the printer's joiner, and supplied in sets.

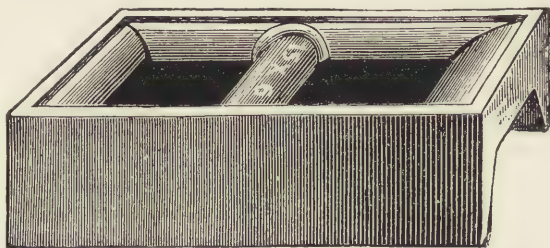
The old-fashioned method of keeping reglet and furniture was to put the pieces in the drawers of the imposing table; but in well-regulated offices this plan is superseded by the use of special racks and cabinets whereon the pieces are placed in order according to their lengths and widths.



FURNITURE CABINET.

Metal Furniture, formerly called French furniture, is used for the same purposes as wood furniture, to which it is in some respects superior, as it is more accurate and does

not expand or shrink or warp. On the other hand, it is much heavier, and there are no long lengths of it; while its smoothness and rigidity impair its binding properties.



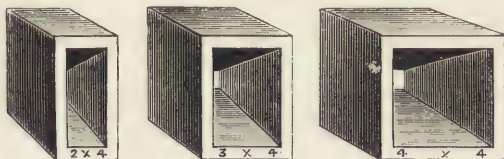
METAL FURNITURE.

It has a deep groove or angular furrow on its top and bottom surfaces. Its height is that of an ordinary lead.

The breadth of metal furniture is always reckoned in pica ems. The improved furniture has the breadth and thickness plainly stamped upon it, as seen in the illustration. This saves much time in avoiding the necessity of measuring any sizes as to which the compositor may be in doubt.

Metal furniture is now nearly always supplied to certain lengths, which are regular multiples of the pica em, and it does not require to be cut up in the printing office.

In width, metal furniture is cast to 2, 3, 4, 6, 8, and 10 pica ems. The lengths run from 4 to 50 pica ems.



QUOTATIONS.

Quotations are large hollow quadrats; they are used sometimes in the place of metal furniture.

They appear to have been at first used to justify sidenotes or quotations in book work, and were called "quotation quadrats." This exclusive use has passed away, and they are now simply hollow quadrats, used for filling up considerable spaces at the beginnings and ends of chapters in book work, and also in job work. Formerly they were cast in two sizes, broad (4-em) and narrow (3-em), but they are now made to the following sizes:—

Great Primer, 2-em, 3-em, 4-em.

Double Pica, or two-line Small Pica, $1\frac{1}{2}$ -em, 2-em, 3-em.

Two-line Pica, $1\frac{1}{2}$ -em, 2-em, $2\frac{1}{2}$ -em, 3-em.

Two-line English, 1-em, $1\frac{1}{2}$ -em, 2-em.

Two-line Great Primer, 1-em, $1\frac{1}{2}$ -em, 2-em, 4-em.

Four-line Pica, 2-em, 3-em, 4-em, 5-em, 6-em, or, as they are marked, 4×2 , 4×3 , 4×4 , 4×5 , 4×6 -em.

When the word "quotations" is used by itself it is always the Four-line Pica kind which is meant.

Metal furniture and quotations are best kept in the cases now made specially for this purpose.



Curvilinear Quadrats.—To enable the compositor to make curved lines *curvilinear quadrats* used to be employed. These are of the same height as ordinary furniture; the inner furniture has a convex surface to make a curve, and the outer a concave surface. The type is placed between, and the angles outside may be filled with type or the ordinary rectangular quadrats. They are never used now in good work.

Triangular Quadrats are also used in certain kinds of job composition. They may be likened to em quadrats cut diagonally across the face and down the shank.

Tables for the Use of Leads.—The following table¹ shows with sufficient accuracy the *number of leads that go to the pound*. Thus, if the leads are nine ems in length, a pound will contain 58 4-to-pica, 85 6-to-pica, or 117 8-to-pica. If the number of lines to be leaded out is known, the weight of leads required may be immediately estimated:—

Length of the Lead in ems pica.	NUMBER TO THE LB.			Length of the Lead in ems pica.	NUMBER TO THE LB.		
	If 4-to-pica.	If 6-to-pica.	If 8-to-pica.		If 4-to-pica.	If 6-to-pica.	If 8-to-pica.
4	130	192	264	26	20	29	40
5	104	153	211	27	19	28	39
6	86	128	176	28	18	27	38
7	77	109	151	29	18	26	36
8	65	96	132	30	17	25	35
9	58	85	117	31	16	24	34
10	52	76	105	32	16	24	33
11	47	70	96	33	15	23	32
12	43	64	88	34	15	22	31
13	40	59	81	35	14	21	30
14	37	54	75	36	14	21	29
15	34	51	70	37	14	20	28
16	32	48	66	38	13	20	27
17	30	45	62	39	13	19	26
18	29	42	58	40	13	19	26
19	27	40	55	41	12	18	25
20	26	38	52	42	12	18	25
21	25	36	50	43	12	17	24
22	24	35	48	44	12	17	24
23	23	33	46	45	11	16	23
24	21	32	44	46	11	16	23
25	20	30	42	47	11	16	22

In this table fractional parts of leads are not given, as they are not practically required.

¹This table is calculated on the basis that 1,056 ems of 8-to-pica, 768 ems of 6-to-pica, and 520 ems of 4-to-pica go to the lb. In practice there may be more than shown in the table. See note on p. 112.

The following table will show the *weight of leads required* for a thousand ems of the various bodies of type. The figures, although they may not always be exactly correct, will often help the printer in his calculations :—

QUANTITY OF SOLID MATTER.	OUNCES OF LEADS REQUIRED.		
	8-to-pica.	6-to-pica.	4-to-pica.
1,000 ems Pearl - - - -	5	$7\frac{1}{2}$	10
1,000 „ Nonpareil - - -	$6\frac{1}{2}$	$9\frac{1}{2}$	13
1,000 „ Minion - - - -	8	$11\frac{1}{2}$	16
1,000 „ Brevier - - - -	9	13	$17\frac{1}{2}$
1,000 „ Bourgeois - - -	$9\frac{1}{2}$	$13\frac{1}{2}$	$18\frac{1}{2}$
1,000 „ Long Primer - -	$10\frac{1}{2}$	$15\frac{1}{2}$	$20\frac{1}{2}$
1,000 „ Small Pica - - -	11	$16\frac{1}{2}$	22
1,000 „ Pica - - - -	$12\frac{1}{2}$	19	25

EXAMPLE.—Matter has to be set which it is estimated will make 20,000 ems small pica solid. Required, the weight of 6-to-pica leads necessary to lead this matter. By the table we find that 1,000 ems of solid small pica require $16\frac{1}{2}$ ounces of such leads; so $16\frac{1}{2} \times 20 = 330$ oz., or 20 lb. 10 oz.

Roughly speaking, a pound of leads covers four square inches; hence, when the space required to be filled is known, it is only necessary to divide the number of square inches by 4, and the result will give the required weight in pounds.

Combinations.—When leads are wanted of a measure to which none have been cut, it is necessary to piece them; that is, to use two or more to make up the required length. Thus to make up leads for a measure of 39 ems, one 24-em lead and one 15-em lead would probably be used, or some other combination of two that would equal the desired width. Leads so used are technically known as “pieced leads,” and in employing this method it is well to reverse the long and the short lead after each line of type to prevent a bulging tendency that would result if this join were made at the same point each time.

The following table shows the combinations that can be formed by leads of seven lengths only, not more than three pieces being required at one time; indeed, only two pieces are used in fifteen of the thirty-eight examples given :—

COMBINATIONS POSSIBLE WITH LEADS OF SEVEN SIZES,
viz., OF 4, 7, 9, 10, 13, 15, AND 20 EMS.

4, 4 = 8	7, 9, 10 = 26	15, 15, 9 = 39
7, 4 = 11	20, 7 = 27	15, 15, 10 = 40
4, 4, 4 = 12	15, 13 = 28	15, 13, 13 = 41
10, 4 = 14	20, 9 = 29	20, 15, 7 = 42
9, 7 = 16	20, 10 = 30	15, 15, 13 = 43
13, 4 = 17	20, 7, 4 = 31	20, 20, 4 = 44
4, 10, 4 = 18	15, 13, 4 = 32	20, 15, 10 = 45
15, 4 = 19	20, 13 = 33	20, 13, 13 = 46
7, 10, 4 = 21	15, 15, 4 = 34	20, 20, 7 = 47
15, 7 = 22	20, 15 = 35	20, 15, 13 = 48
15, 4, 4 = 23	20, 9, 7 = 36	20, 20, 9 = 49
20, 4 = 24	15, 15, 7 = 37	20, 15, 15 = 50
9, 9, 7 = 25	20, 9, 9 = 38	

The printer has also at his command the seven single pieces used, viz.: 4, 7, 9, 10, 13, 15, and 20 ems. By using four, five, or six pieces together, the above combinations may be extended consecutively to one hundred ems.

It is desirable to avoid, as much as possible, the use of two leads of the same length for piecing for the reason already stated, and because joined leads are liable to "spring," causing the irregularity called a "squabble."

Justifying with Leads.—With types and leads cast to the point system this is an easy matter, for every body will justify with every other with the use of a lead or leads of the body of one point (12-to-pica), $1\frac{1}{2}$ point (8-to-pica), 2 points (6-to-pica), or 3 points (4-to-pica).

The following is a table of the *leads required to justify with types* of ordinary British bodies, from Pearl to Great Primer inclusive. It is not absolutely accurate if applied to all bodies of type, owing to the variations of the bodies among the different type-founders, but may be found useful:—

<i>To justify with</i>	<i>Use these Leads :</i>
PEARL - - - -	One four- and one eight-to-pica.
RUBY - - - -	One four- and one six-to-pica.
NONPAREIL - - -	Two fours; three sixes; or four eights.
EMERALD - - - -	One four, one six, and one eight.
MINION - - - -	One four and two sixes.
BREVIER - - - -	Two fours and one six.
BOURGEOIS - - -	Three eights and two sixes.
LONG PRIMER - -	Three fours; or six eights.
SMALL PICA - - -	Two fours and two sixes.
PICA - - - -	Four fours; six sixes; or eight eights.
ENGLISH - - - -	Three fours and two sixes.
GREAT PRIMER - -	Four fours and two sixes.

Casting Leads.—In printing offices at a distance from the ordinary printers' supply warehouses it is often convenient to be able to cast leads. A complete set of apparatus may be procured at a cost of about £3. It consists of the following: A small furnace, a melting pot, a set of ladles, a small marble slab, a lead mould with shifting screws, a lead scraper, straight-edge, and trying tool or gauge. A packet of rouge and about a pound of Spanish brown ochre will be required also.

The mould should have shifting screws, permitting of its being altered to make a lead of any body up to pica (when it will be called a clump). First cleanse it from grease which may have accumulated on it in the process of manufacture by pouring molten metal into it for ten or fifteen minutes. Then dip a clean sponge in hot water and slightly squeeze it into the mould until the hissing noise ceases. This must be continued until a coating of fur forms over the face of the mould, similar to that on the inside of a tea kettle. This fur must not be wiped off, but a solution of thin rouge, or ochre and water, must be run down the mould while it is hot.

In the case of casting very thin leads, or if it is in any way defective, the mould may be prepared by smoking the inside of it by holding it over a gaslight or candle so as to produce a coating of lampblack; but the process above described is the surest.

Having prepared everything as directed, proceed to set the mould. We suppose that 4-to-pica leads are about to be cast. Take two nonpareil en quads, place one at the top and the other at the bottom of the mould, and gently put the screws down on to them. After well heating the mould, cast four leads and clean off the edges with the scraper; then with an ordinary lead cutter nip off the ragged ends. This being done, lay the four leads on the top of one another on a small flat surface—a piece of planed iron would be preferable—place four pica quads, one on each side at each end of the leads, and, holding them up to the light, lay the straight-edge across the leads and quads, so as to tell whether they are true to gauge. If they are all right, go on casting; but if there is the slightest defect, it must be remedied, as the leads will not be true, and therefore useless. It will be as well to gauge the leads occasionally to test whether they are true. The heat of the metal and the size of the ladle must be regulated by the thickness and length of the lead to be cast. Care should also be taken in gripping the mould in the centre. The small marble or iron slab is necessary to drop the leads upon as they are delivered from the mould—this is to prevent the leads from twisting while they are hot.

Be careful in testing the leads to notice which is the top and which is the bottom of the leads as they are delivered ; for if they are not all laid the same way it is impossible to detect where the error lies. The safest way is to mark each of the four leads as they are delivered from the mould, as after the ends are cut off and the edges are dressed it would be difficult to tell the top from the bottom. The solution of rouge and water must be frequently applied, as it keeps the mould free from grease or grit of any kind. Be careful not to touch the inside of the mould with the fingers or anything which would be likely to leave a deposit of grease.

CHAPTER XI.

BRASS RULE.—Plain, Ornamental, Column, Bevelled, Combination, Perforating, Scoring—Brass Rule Cases—Rule Shears—Rule Cutters—Rule Mitring Machines—Rule Bending—Brass Circles and Shapes—Line Formers—Type Metal and Zinc Rule.




Rule consists of strips of metal of the height of type, and is used for forming lines, and for making varied designs. It is chiefly made of brass, though sometimes of type metal or zinc. *Brass rule* may be divided into “plain” and “fancy” or “ornamental.” Each of these is made to various bodies; the plain rules from 16-to-pica up to a full pica; the ornamental from 4-to-pica to 2-to-pica (nonpareil). Double or treble rules are from 6-to-pica to great primer bodies. The following show some graduated faces:—

PLAIN RULE.

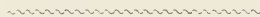
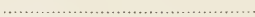






<i>8-to-pica rule thin face up.</i>	<i>6-to-pica rule turned.</i>
<i>12-to-pica rule turned.</i>	<i>4-to-pica rule face up.</i>
<i>8-to-pica rule turned.</i>	<i>4-to-pica rule turned.</i>
<i>Nonpareil rule turned.</i>	

Plain rule is used to make plain lines. The most common bodies for plain rule were 4-to-pica (3 points) and 8-to-pica ($1\frac{1}{2}$ point), but every size is now constantly used from 12-to-pica (1 point) upwards. The top is bevelled, usually on both sides, so as to show a fine line along the middle of

the body. If plain rule be turned, or set bottom uppermost, it naturally makes a blacker line than the face does (see examples annexed). The "mid face" or medium rule, as it is sometimes called, is a modern addition to the ordinary faces, and it is always better to use heavy-faced rules specially so cut than to turn ordinary rule. Two or more of these rules may be used together.¹

By using two pieces of plain rule, one face up and the other turned, we have the "thick and thin," or shaded, ; by placing two together, face up, we get the "double-fine" rule ; a "treble" rule has the thick side up in the middle, . These, as well as other combinations of face, are to be had from the rule makers on one piece of metal, and it is better to use such than to combine two or more rules to produce the result.

Below are some examples of *fancy or ornamental* rules:—

WAVED. 	DOTTED. 
THICK WAVED. 	WAVED DOTTED. 
CHEQUER. 	SQUARE DOTTED. 
DIAMOND. 	SLANT DOTTED. 

Combination rules are ornamental rules so designed that when two or more are combined they make pleasing patterns.

¹ Both medium and double medium face rule are now supplied by the leading founders in labour-saving sets, which comprise an assortment of pieces from 1 em Pica, rising by ens to 6 ems, and by ems to 25 ems, with single and double mitred pieces. Single medium is on 8-to-pica body, and double medium face on 4-to-pica body. This rule is found almost indispensable in modern job work. Similar faces of German rule, as well as the Barrock rule, are made to points of the Didot point system, and the gradation in sizes of the various pieces is excellent.

Methods of arranging them will be referred to in the chapter on Jobbing Work.¹

Column rules, intended to divide columns of type (generally in newspapers), are usually made to type bodies, from Nonpareil to Pica, *e.g.*, Nonpareil column rules, Brevier column rules. These two are the most usual.

Bevelled rule has the face line all on one side, instead of having it in the middle with a bevel on both sides of it. This rule enables the compositor to make neat corners without mitring.

Perforating rule is coarse dotted rule a little higher than type. When placed in a forme, the dots pierce through the paper. It is made of brass or steel, and is used for tickets, dividend warrants, etc.

Scoring rule is plain rule, also a little higher than type. It slightly cuts into or scores a card when the pressure of the press is applied. This is used best by itself, and not in connection with a type forme, lest it should cut the inking rollers. It is, preferably, made of steel; the two ends should be bevelled off.

Rule—How Sold.—There are two qualities of ordinary plain brass rule: 1. Spring, or hard brass rule, which, if bent, recovers itself when the pressure is removed. (It may, however, be made to retain any required shape by heating it until about to turn red, and then immersing it in cold water.) 2. Soft rule, which always retains the shape to which it is bent. The spring rule is always supplied unless the soft be ordered. Rule is generally sold in "lengths" of 16 or 24 inches, and it is then cut up by the compositor to the dimensions suitable to the job in hand. It is, however, often preferable to buy it already cut up

¹ Combination rules are also in sets of various designs, thicknesses, and lengths. For border-making they can be applied more expeditiously than type borders. Tasteful variation in arrangement of an ordinary set will give a considerable number of effective patterns.

to various widths, each being some multiple of a pica em. These are sometimes called "case rules," because they are usually kept in cases provided for the purpose, with divisions to suit the several lengths.¹ Different makers divide the case differently. Here is one sort:—

Long Pieces, Double Rules, &c.													
38				40				42				44	
26		27		28		29		30		31			
22½		23		23½		24		24½		25		25½	
18½		19		19½		20		20½		21		21½	
13		13½		14		14½		15		15½		16	
16½		17		17½		18							
Small Pieces.	3½	4	4½	5	5½	6	6½	7	7½	8	8½	9	9½
	10	10½	11	11½	12	12½							

BRASS RULE CASE.

Rule Cutters.—Rules may be cut with a pair of scissors or shears, or with a proper rule cutter. If shears are used, great nicety is required to get the rules, especially if small, to the proper size. In cutting a thick rule, let the lower arm of the shears rest firmly upon something, and the work will be facilitated. Messrs. J. M. Powell & Son have brought out some improved shears, in which there is a combination of levers enabling rule to be cut much more easily and better than with ordinary shears.

Rule Cutting Machines.—There are several kinds of rule cutters, each of them being adapted also for cutting leads. The "Ordinary Lever Cutter" is a lever of the second kind,

¹ An assortment of brass rule, of a moderate extent, consists of the following of 8-to-pica body:—

64 Pieces each from 1 to 15½ ems Pica, rising a Pica en.

40 Pieces " 16 to 25½ " " "

40 Pieces " 26 to 36 " " 1 Pica em.

30 Pieces " 38 to 50 " " 2 Pica ems.

that is, it is hinged at one end, the power being applied at the other. On the lever, a short distance from the hinge, is a knife edge which cuts the rule or lead when the lever descends, very much as the shears cut it. The machine has a bed with a gauge on it, which is adjusted according to the length of rule wanted and then screwed down, the rule being placed on the bed against the gauge.

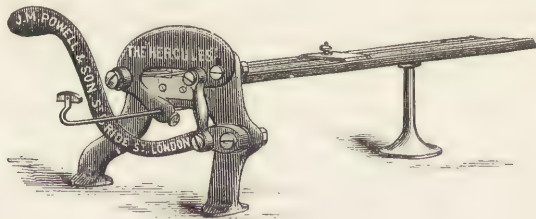
The "Gem Rule Cutter" is an excellent machine specially adapted for cutting easily, and with the least



GEM RULE CUTTER.

possible burr. A spring, connected with the handle, enables it to recover itself after being pressed down to sever the rule. The slide gauge is fixed at any point by a finger screw.

A third and equally good kind of rule cutter is called the "Hercules," from its great power derived from a judicious



HERCULES RULE CUTTER.

combination of levers. It will cut through brevier column rules. Special gauges admit of instantaneous adjustment

for leads and rules at the same time, without removing the screw. There is also an adjustable front gauge, as shown in the cut.

Cutting Rule.—If a rule cutter is employed it is only necessary to slide the gauge along, and to fasten it at the proper place, to ensure the rule being cut to the exact length required. Make up the gauge very accurately, with pica or nonpareil quadrats if possible. Bring down the handle and the knife with a sharp, steady action, increasing the speed as the knife falls, steadying the rule to be cut with the fingers of the left hand, being careful, of course, to keep them out of the way of the knife.

If very small pieces of rule are required, they may easily be cut with a little management. Suppose you want a 2-em brevier rule. Take a few odd pieces of rule that are of no uniform length, and cut them, say, to 12-em pica length. Then without removing the slide of the cutter, place two brevier ems against it and recut the rules. The pieces cut off are the required size. Next reset the cutter to the size of the shortened rules, replace the two ems, cut as before, and so continue until the rules become too short to be held in place; or let the slide remain unmoved and add a 2-em quadrat as often as required.

Rules that are cut with shears always get more or less bent, and require to be straightened by being beaten on an imposing surface. This must be carefully done, or they will be permanently injured.¹ Those that are cut with a proper rule cutter are not so bent, but they always have a roughness or burr—however good the rule cutter is—on the edge that has been cut. The compositor who wants to do nice work will take pains to remove this burr. He may rub it off on the imposing stone, and if done very carefully this is efficacious; but a better plan is the following: Get two

¹The best way to straighten bent rule is to put a smooth quoin on it, and to strike the quoin with a hammer or a shooting-stick,

files, both fine ones, but one large and one small. (Let these be the compositor's own property, and their use "non-transferable" to any one else.) The small file should be one such as a watchmaker uses. The large file is to be used first, and the small one for finishing.

Besides causing the burr, the ordinary rule cutter makes a bend or deflection in the face of the rule, or the fine edge which makes the printed line. Lay this deflected or turned edge of the rule on the first or index finger of the left hand, holding the rule with the thumb and fingers, and, keeping the file parallel with the rule, pass it carefully over the corner. The turned portion of the rule can thus be taken off without perceptible injury to the face.

Dashes, Corners, Circles, etc. — Dashes are generally made to Nonpareil or Brevier body, and to various lengths. They are cut in solid brass. Ornamental dashes, or French rules as they are sometimes called, are sometimes cut in brass and sometimes cast in type metal. They are seldom used now.

Oxford Corners are best bought from the type-founders, but they can, of course, be made with rules and quads.

Brass Circles, of a plain and ornamental design, are supplied. They are made to any size, and are on square brass bodies, the space inside being left for the insertion of type. The method of using these will be explained hereafter. *Ovals* may also be had, also on rectangular brass bodies; as well as various other shapes, such as shields, hearts, diamonds, etc.

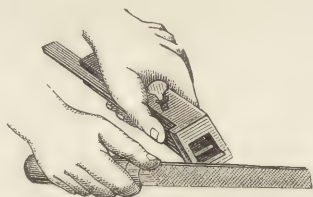
Metal Rule.—Type metal rule is supplied by the founders in upwards of 100 different designs. It may be cut up and mitred like brass rule; and in many cases it is superior to brass rule (although very much cheaper) for making borders, etc., to cards. It requires more careful manipulation than brass rule, but the common belief that it is so very liable to become battered is quite unfounded.

Zinc Rules, both plain and ornamental, are used chiefly for newspaper and poster work. When new they are equal in appearance to brass, and their cost is only about one-third of those in that metal, but they rapidly oxidise, and therefore should be cleaned only with benzoline or paraffin.

Wood Rule of various designs, and supplied in three-foot lengths, is more generally used in posters than either zinc or brass rule.

Mitring Machines.—For the purpose of making a square or other angular figure, rules ought to be mitred, like a picture frame. There are two appliances for this operation.

The *Mitring Guard*.—This is a kind of long narrow box, one end of which is cut off at a common mitre, or an angle of 45 degrees. It contains a set screw, by which the

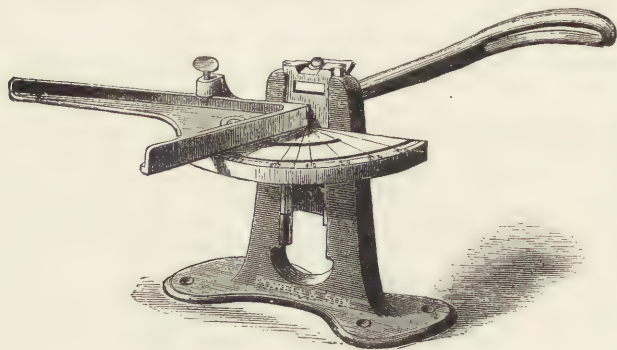


MITRING GUARD.

rule, previously cut to the required length, is securely fixed, the portion to be taken off projecting. Two files are provided—one rough, one fine. Taking the rough file in the right hand, the workman files away at the projecting portion of the rule until no more can be taken off. The smooth file is next taken up, and any roughness on the rule removed. The face of the guard, being of hardened steel, will allow no more to be taken off than is necessary to produce the angle.

The *Mitring Machine* is a more convenient and perfect apparatus. It comprises a semicircular table of polished iron, on which moves an angular slide. The rule to be cut is placed at the back of the slide against a guide. The handle

is attached to a cutter, and when moved up and down pares off a portion of the rule at an angle, dispensing with the use of files. This angle is determined by the position of the slide, which, when unloosed by a screw and nut under-



MITRING MACHINE.

neath, moves over the table from side to side. The table is, or should be, marked with a scale of lines and figures denoting the angle as measured by degrees.

The following table shows the adjustment of the scale to form the various shapes mentioned :—

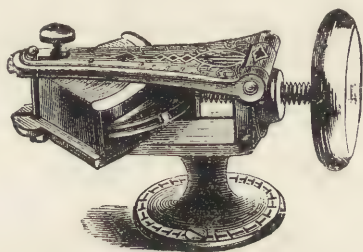
	Degrees.
Equilateral Triangle - - - - -	60
Right-angled Triangle with two equal sides - - -	67½
For each end of base, and for other corner	45
Square - - - - -	45
Equilateral Pentagon - - - - -	36
„ Hexagon - - - - -	30
„ Octagon - - - - -	22½

The machine may be screwed down to the end of a bulk or a bench, and the workman when using it has his left hand at liberty to steady the rule. More complicated and costly machines can be obtained, but with a little ingenuity and care the above will meet all ordinary requirements. Moreover, an experienced compositor can dispense with a machine,

being always able to mitre his rules with a file, by holding them on the projecting end of his lower case. In mitring rules always *undercut* the lower part of each mitred end to prevent binding and to allow the two mitred corners to touch perfectly.

Rule bending may sometimes be done with the fingers. A small pair of pliers may be used, but they are apt to make irregular and sudden bends. A round wooden block may also be used; or the brass may be hammered against the edge of a round piece of board.

The *Bending Apparatus* enables ordinary brass rule to be curved to various ornamental shapes with ease. The rule



RULE-BENDING APPARATUS.

which is to be bent should be placed between the brass segments; then close the lid and lock it; afterwards turn the screw. Before the rule is bent cut it to the right size, and place exactly in the middle. It is better, when using metal rules, to hold them over a gas or spirit flame before bending.

With this apparatus it is possible to make right-angle corners and also round corners, and for this purpose are supplied two steel dies. Take out nine of the smallest brass segments, putting in their place the two steel dies, lay the rule in the exact middle, and turn the screw. Care must be taken before screwing up the segments that the lid is shut and locked—through neglect of this the pin is likely to be bent or broken.

CHAPTER XII.

COMPOSING ROOM PLANT (*continued*).—Imposing Surfaces—Chases—Chase Racks—Side and Foot Sticks—Saw and Block—Quoins—Mallet—Shooting-stick—Mechanical Quoins—Planer—Page Cord—Bodkin—Correcting Nippers—Type Scales—Proof Presses—Forme Carriages.

The Imposing Surface is a cast-iron plate which constitutes the top of a table. Its face should be perfectly smooth, otherwise it will wear away the types which are moved over it.

Formerly imposing surfaces were made of stone, chiefly slate, owing to its smoothness and capability to take a good polish, and the word "stone" is even now applied to the surface generally, although it no longer describes its material. Thus, to lay matter "on the stone" is to place it on the imposing surface.

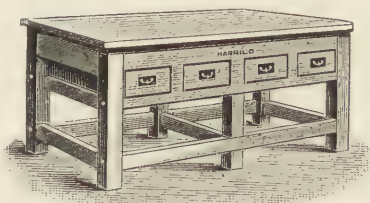
The imposing surface is now almost always made of planed iron, hence by some makers these appliances are called "imposing irons." Whatever be the material adopted it is necessary that the surface be absolutely level, and in setting it up the spirit level may be employed.

The best qualities of imposing surfaces are ribbed underneath, to give extra strength and prevent warping. They must be accurately planed to avoid wearing the feet off the type. The sides, ends, and the underneath parts of the edges should also be planed true.

The thickness of the plate varies according to its superficies, from half an inch to an inch; so that the plate is

strong enough, its thickness is not material. When a slate is employed its usual thickness is an inch and a half.

Around the edges a slight indentation, about an inch in breadth and a pearl in depth, is sometimes made to rest the end of the galley on when type is being transferred from the "stone" to the latter or *vice versâ*. This plan is chiefly adopted in offices where one description of galleys only is employed; where a variety of galleys of different thicknesses is used the indentation is not advantageous.



IMPOSING SURFACE.

The imposing surface is mounted on a frame of well-seasoned wood, the parts of which are strongly bolted together. The height of the whole is usually three feet, although this varies in different offices, some printers preferring a higher "stone" than others. A low "stone" is more convenient when formes have to be lifted on to it; but in correcting formes it involves much stooping on the part of the workman, and the type on it is not so near his eyes.

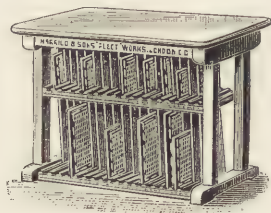
The superficial area of the imposing surface varies according to the class of the work to be done on it and the available space in the printing office.¹

¹The usual sizes made are:—

		Length.		Breadth.				Length.		Breadth.	
		ft. in.		ft. in.				ft. in.		ft. in.	
Royal	- - -	2	6	-	2	0	News dbl. royal	-	4	0	- 2 7
Double crown	-	3	0	-	2	2	Treble royal	- -	6	0	- 2 7
Double demy	-	3	4	-	2	4	Four royal	- -	8	0	- 2 7
Double royal	-	4	8	-	2	3					

Intermediate and extra sizes are also made.

The space underneath the surface may be utilised in various ways. As shown in the illustrations, there may be drawers fitted up to contain quoins, furniture, mallet, etc., or a galley or forme rack may be fitted up in it. If drawers are adopted they should be on good oak runners, and double fronted, so as to be drawn out on either side of the stand, to avoid the necessity of having to walk to the opposite side to open them. For this object stout iron handles are fixed both to the front and back of the drawers.



IMPOSING SURFACE WITH FORME RACK.

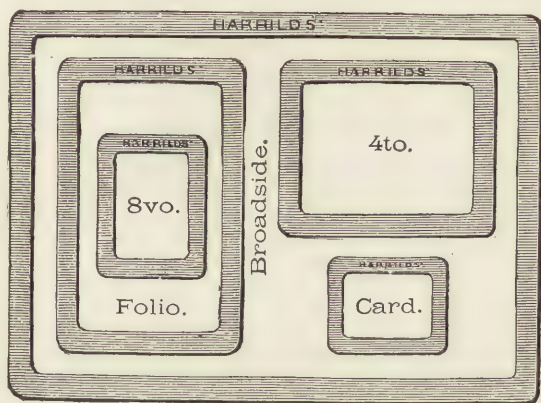
Forme racks underneath imposing surfaces are by some printers regarded as objectionable, as the "locking up" and "planing" of formes may cause much vibration, and tend to loosen the type in the chases. Some frames of imposing surfaces are fitted with a drawer, pigeon holes for keeping lengths of wood furniture and reglet, for laying up standing matter, woodcuts, etc., galley shelves, forme rack, and letter boards.

Chases are the iron frames which enclose pages or formes of type. The principle on which they are made will be seen from the diagrams following.

Chases are in height somewhat lower than furniture. They are made either of *wrought* or *cast* iron.¹

¹ As it is dangerous to lock up a large forme, say over double-demy, in a broadside chase, "patent grooved chases" are now supplied in which movable bars run in grooves inside the chase. The bars are, in a placard forme for example, where the white space will be, and

All chases, except those for small and light formes, should be made of *wrought* iron. Chases of this material may be easily distinguished from those of cast iron. 1. Cast chases are rougher on their surface than wrought iron ones. 2. Wrought iron chases sometimes have a slightly reddish appearance, which is caused in the forging of them; they are also smoother, and often bear traces of filing and the hammering to which they have been subjected. Cast chases bear the marks of the sand mould in which they are formed,



JOBGING CHASES.

and often bear the name of the maker. 3. Wrought chases have thinner rims than cast ones, and they are sharper at the edges; the inside corners are square instead of being rounded off, and they are finished with greater accuracy than cast chases. 4. All bars in cast chases are fixed; in wrought chases they are movable.

It is very essential that chases should be not only strong, but perfectly rectangular, the inner sides presenting no

take the place of reglets. Practically they sub-divide the chase into several smaller ones. Very large and heavy formes, such as four-royal, may in this way be locked up with perfect safety.

unevennesses, and being exactly parallel one to the other. If this be not so, good work is difficult if not impossible.

Chases are of three kinds—"Jobbing," "Book," and "News." They are subdivided into broadside, job, heading, and slip chases.

Jobbing Chases are merely rectangular iron frames, without divisions.

Broadside Chases are those which are the full sizes (without cross-bars) of the several sheets, such as demy, royal, double crown, etc. *Job Chases* are the folio, quarto, and octavo, etc., of either of these sizes.¹ *Heading Chases*, very long and narrow, are adapted for type used in printing the headings of account books, etc. *Slip Chases* are also long and narrow. They are used for such jobs as play-bills, and are usually made to the following sizes: Demy long folio (24 by 8 inches), double crown long folio ($31\frac{1}{2}$ by 9), and double demy long folio (36 by $10\frac{1}{2}$).

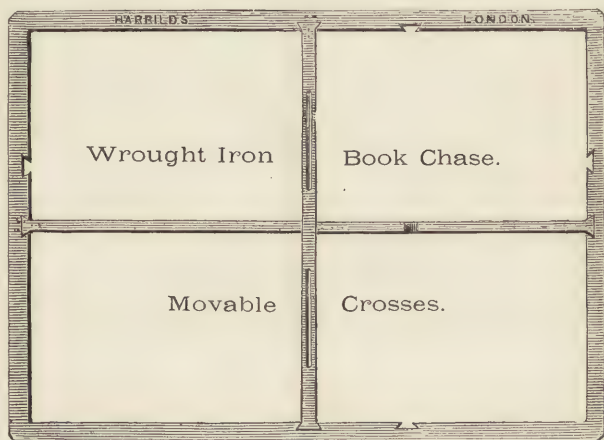
Book Chases, which are sold in pairs, are made with cross-bars, as shown in the diagram opposite, which may be fixed or movable. If the cross is fixed the chases are generally of cast iron, but if movable they are of wrought iron. Movable crosses consist of two bars, having projections which fit into slots in the chase, as shown in the diagram. These are fixed in one or other of the two pairs of slots, according to the nature of the forme to be imposed. As they appear in the illustration they are set for 4to or 8vo. If the long cross-bar were moved up to the higher notches the chase would be set for 18mo; if this long bar were now replaced as before and the short bar were placed in the notches to the right, the chase would be set for 12mo.

¹ In the illustration are shown five chases of different sizes; the largest is a broadside chase, the next is a folio chase, and the others are marked with sufficient definiteness.

The most usual sizes of bookwork chases are the following:—

Chases.	Inside Measurement.	Chases.	Inside Measurement.
Double royal - -	40 by 26 inches.	Royal - - -	26 by 20½ inches.
Double demy - -	36 by 24 "	Demy - - -	24 by 19 "
Double crown - -	32 by 21½ "	Crown - - -	21 by 17 "
Double foolscap -	29 by 19 "	Foolscap - -	19 by 15 "
Super royal - -	28 by 21 "	Post folio -	16¼ by 10 "

The dimensions of various makers differ sometimes.



BOOK CHASE.

News Chases are made to suit the size of the journal for which they are required. They are made in sets of two or four, and are of the shape shown in the diagrams. It will be seen that the sides are of two thicknesses, being stronger and thicker on the outside edge than on the inside. When the inside edges are brought together their combined thickness is only equal to that of the outside edges. This thickness, which forms the margin in newspapers, may, however, vary according to circumstances. It is often regulated by the width of margin in the periodical, etc., for which they are intended.

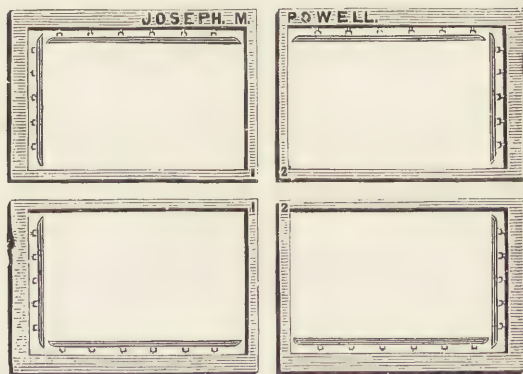
Chases of this kind are called *folding chases*. They are

sold according to weight, and should always be of wrought iron or steel.



NEWS CHASES.

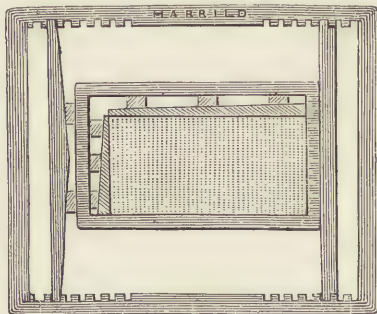
Newspaper folding chases are sometimes fitted up with screws and nuts, projecting from the side thus:—



SCREW FOLDING CHASES.

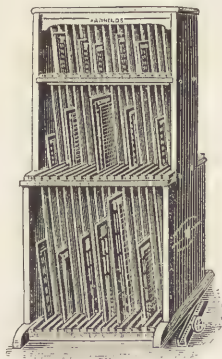
It is only necessary to turn these nuts to tighten the forme.

Rack Chases, for fixing small formes on presses and machines, are made the size of a press table, and obviate



RACK CHASE.

the use of furniture. In these the sides are racked to admit of two bars, which can be placed at any required distance apart. One bar is wedge-shaped, to answer the purpose of a sidestick, and to be used with quoins. The drawback to the use of rack chases is that the bars are often not rigid enough.



CHASE RACK.

Chase Racks.—Chases, whether empty or containing formes, when not in use are kept in chase racks or forme

racks, which are usually shaped as shown in the illustration annexed. The space under the top of imposing surfaces is sometimes fitted up with chase racks (see p. 136).

Side and Foot Sticks are pieces of furniture of a wedge shape (see p. 16). Formerly they were always made of wood, but now they are very frequently made of iron or other metals.

Wooden side and foot sticks are supplied by the printers' joiners in "lengths" of 36 inches, or cut up to certain sizes, according to the dimensions of the job in which they will be used. Metal side and foot sticks are made generally of wrought iron, and to specified sizes.

The thickness or height of footsticks and sidesticks should be that of the ordinary furniture.

Saw and Block.—A small *saw-block* and *saw* are required in every printing office, for cutting up wood furniture, reglet, etc. In some offices a small circular saw is used, which does its work quicker and better than the ordinary hand saw. It should be fitted up with a treadle to actuate the saw, and the top should be contrived so as to allow of wood



SAW AND BLOCK.

being cut at various angles. If a common saw is used it should have a strong brass or steel back.

Quoins are used for securing the matter, or "locking it up." They consist of small wedge-shaped pieces of wood, and when applied to the sidesticks make two parallel outer surfaces. When driven up by the mallet and shooter they exercise the pressure on the type which is called locking it up.

Mallet and Shooting-stick.—The common wooden quoins are tightened by being driven in the necessary direction by the use of the *mallet* and *shooting-stick*.

The *mallet* is an ordinary wooden hammer, somewhat similar to that used by carpenters. Compositors often use heavier mallets than are necessary, for when a forme is accurately made up and suitable quoins are selected comparatively little pressure is needed to sufficiently lock it up.



MALLET, SHOOTING-STICK, AND PLANNER.

The *shooting-stick*, or shooter, transmits the pressure from the mallet to the quoin, which could not conveniently be struck by the mallet. There are various kinds of shooting-sticks, some consisting of a piece of tapered boxwood, eight or ten inches long; others are of horn, others again are tipped and bound with iron, brass, or gun metal, as in the woodcut above. The indentation in the tip is applied to the edge of the quoin, and prevents the shooting-stick from slipping. The metal tip should not be too hard lest it should injure the imposing surface. It is for this reason that some printers will not use metal at all.

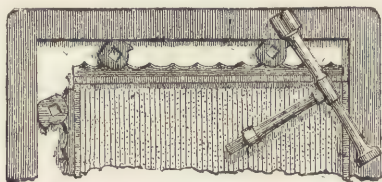
Locking-up Apparatus.—The system of locking up formes by the application of wooden wedges driven home with a mallet and shooting-stick is open to objection, on account of its expenditure of physical exertion and the waste of material to which it often leads. Several mechanical appliances have been brought out with the object of superseding the ordinary wooden quoin and sidestick. The object aimed at in all instances has been to obtain great lateral pressure at certain spots with a minimum of power. Those which are known in this country are:—

1. The *Marinoni System*.—In this, wedge-shaped sidesticks of iron are used, and round cogged nuts running on notches in the sidestick. They are worked with a key shaped like a railway door-key, and the more they are revolved the more



THE MARINONI LOCKING-UP APPARATUS.

they tighten or loosen the forme, as shown in the diagram. The key is inserted in the orifice of the nut, and the locking up is done by turning it with the hand. The defects of this are that the points of pressure are necessarily limited, it



LAVATER QUOIN.

takes some little time to adjust, and it is expensive. The Marinoni system, however, has been used in large offices for many years.

2. The *Lavater System*.—In this the sidestick is not

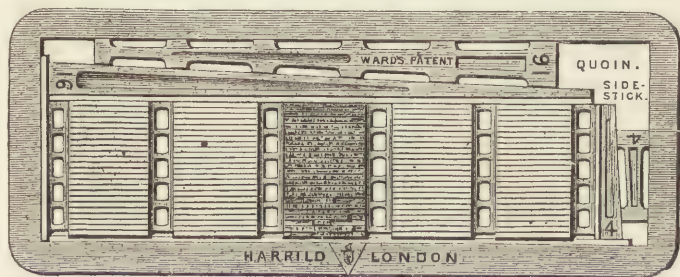
wedged, but indented regularly with sockets, in which the nut can be placed, so that the pressure can be brought to bear at any place at the will of the operator, who, by a slight turn of the key, exercises great power direct upon the matter. The leverage is produced entirely on the nut or cam, and there is little or no side drag.

3. *Hempel's Steel Quoins.*—These quoins are double wedges, and are for use with straight furniture. They have



HEMPEL'S QUOINS.

a series of grooves, into which a coggled key enters, and each turn of the latter moves them so as to exert greater lateral pressure on the forme. They are made in two sizes, one having a lateral spread of 1-em pica, and the other $1\frac{1}{2}$ -em pica.

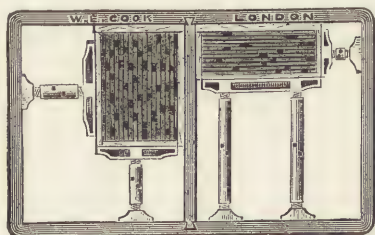


WARD'S LOCKING-UP APPARATUS.

4. *Ward's Lock-up Apparatus.*—This is a close approximation to the principle of the quoin and sidestick. Ward's has the shape of an ordinary side or foot stick, but the

fitting-in stick has protuberances on both sides, corresponding to quoins. It may be regarded as a series of quoins connected together. The ordinary mallet and shooting-stick are used for driving the quoin, and the more it is driven home the greater the pressure on the type and the chase. The only objection to this system is the danger of throwing the forme out of the square by the forward movement.

5. *Cook's Locking-up Apparatus*.—This consists of iron furniture, in which are one or more female screws, and of two kinds of male screws to use with them : one has a cylindrical head, and the other consists of a cylinder with screws at



COOK'S LOCKING-UP APPARATUS.

both ends working different ways. The male screws are inserted in their respective holes and screwed up, and then the apparatus is inserted in position in the forme. The screws or cylinders are then turned with a tommy until the requisite tightness is obtained.

6. The "*Wickersham*" Patent Quoin.—This is the most recent and perhaps the most effective quoin that has been yet introduced. It may be described as a flat oblong box, divided lengthwise into two ; within is a steel nut or cam working in runners, with a square hole for a key. When the key is applied and the nut turned towards its largest diameter, the box opens and the pressure is obtained. The very slightest movement is required, and the pressure is very great. On the release of pressure a spring at each

end brings the sides of the box close again, and the forme is unlocked. Its length is $1\frac{1}{2}$ inch; its width, when closed, about $\frac{5}{8}$ inch; it has the same depth as leads or furniture.

By the above methods a forme can be locked-up in silence, a matter which is of some consideration. It cannot be said that any of them has come into general use, although they have all been before the trade for many years. Printers, as a rule, consider that a good wooden quoin and furniture well adjusted and properly tightened are, after all the securest fastening for a forme.

The **Planer** is a piece of hard wood, about 8 inches long by 4 inches wide, and rather more than an inch thick (see illustration on p. 143). It is placed on set-up type, and when tapped by the mallet the pressure planes or levels the type.



BODKIN AND CORRECTING NIPPERS.

Page Cord is the thin strong twine used for tying up pages of types, and made specially for the purpose.

Bodkins.—For the purpose of withdrawing a wrong type from a forme the compositor needs a bodkin, which is a strong, sharp, needle-like tool, fitted into a handle.

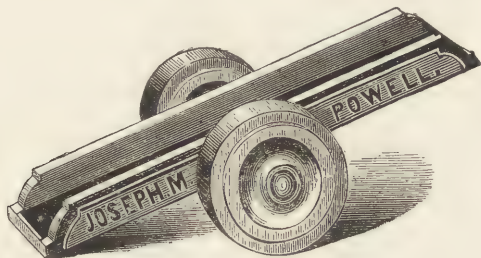
Correcting Nippers are tweezer-like implements also used for correcting erroneous composition. They are specially useful for table work.

Type Scales are measures of boxwood or ivory, graduated for the measuring of matter in ems of various bodies. Some are made to fold up for the pocket, like carpenters' rules.

Proof Presses.—For “pulling proofs” (*i.e.*, printing them) the composing room is generally provided with an

Albion or Columbian Press, with ink-table, roller, etc.; in newspaper offices galley presses take the place of these. Illustrations and descriptions of these presses and their accessories are given in the part relating to press work (consult index).

Forme Carriages, or *Trollies*, to convey heavy formes to the press room, or from one part of the composing room to



FORME CARRIAGE.

another, are made as shown above. The wheels should have rims of vulcanised indiarubber, which enable the carriage to travel about noiselessly, avoid sudden shakes from any inequalities in the floors, and permit of the forme being twisted round with ease.

PART II.

THE RUDIMENTS OF THE COMPOSITOR'S ART.

CHAPTER XIII.

THE LAY OF THE CASE.—Various Schemes—The Keeping of Wood Letter.

The Lay of the Case.—The various tools and plant used in a composing room having now been described, the reader is in a position to learn the order in which the various types are kept in the cases, the technical term for which is “the lay of the case.”

It is a matter of great importance, and one that has received much study, to arrange the several letters, points, etc., in the most convenient manner in the boxes. The types most frequently required should be nearest to the hand of the compositor as he stands at work, and those least wanted may be placed in the most remote boxes. It has been calculated that in setting up the common word “the,” according to the ordinary arrangement of the types, a compositor’s hand has to traverse about forty inches. If those letters were removed to a less accessible situation, this distance would, of course, be increased in the ratio in which the letters were removed. As a man picks out about 1,500 types, and can replace, or “distribute,” no less than 5,000 on an average per hour, it will be seen how necessary it is that the most economical disposition of the boxes should be adopted.

The system on which the various types are distributed among the various boxes in a case is called the *lay of the case*. It varies to some extent according to the character of the work to be done, and unfortunately varies in some minor details in different offices. We shall here give only three of these different lays.

Lays for Book and News Work.—The following is the lay of the case which used to be generally adopted in offices where book work is chiefly done, and is still adhered to in some old-established printing houses :—

Upper Case.

A	B	C	D	E	F	G	A	B	C	D	E	F	G
H	I	K	L	M	N	O	H	I	K	L	M	N	O
P	Q	R	S	T	V	W	P	Q	R	S	T	V	W
X	Y	Z	Æ	Œ	U	J	X	Y	Z	Æ	Œ	U	J
â	ë	î	ô	û	—	£	â	ë	î	ô	û	§	‡
1	2	3	4	5	6	7	á	é	í	ó	ú	||	†
8	9	0	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	k	à	è	ì	ò	ù	¶	*

Lower Case.

—	]	æ	œ	'	j		Thin Sp.	)	?	!	;	...	fl
&	b	c	d	e			i	s	f	g			ff
h.s.													fi
ffi	l	m	n	h			o	y	p	,	w	En Quad	Em Quad
ffl													
z	v	u	t	Thick Spaces			a	r	q	:		Large Quads	
x									.	-			

OLD FASHIONED BOOKWORK LAY.

The following lay, suggested by the *Printers' Register* in 1880, is recommended as superior to all others, both for

book and for news work. Its chief merit lies in the fact that in both cases the types most in demand lie nearest to the compositor's hand. In the upper case the small caps and the sorts seldom required are in the left half, where the manu-

Upper Case.

â	ê	ë	î	ï	ô	û	$\frac{1}{4}$	$\frac{1}{2}$	@	¶	=	~	⚡	†	||
à	é	è	ì	í	ó	ù	$\frac{3}{4}$	$\frac{1}{8}$	8	9	o	*	†	‡	§
....	%	\$	lb	ℓ	$\frac{3}{8}$	$\frac{5}{8}$	$\frac{2}{3}$		1	2	3	4	5	6	7
x	y	z	Æ	Œ	U	J			X	Y	Z	Æ	Œ	U	J
A	B	C	D	E	F	G			A	B	C	D	E	F	G
H	I	K	L	M	N	O			H	I	K	L	M	N	O
P	Q	R	S	T	V	W			P	Q	R	S	T	V	W

Lower Case.

()	[]	”		z	x		v	?	!	æ	œ	fl	ffl
c						e	i		s	p	w	ff	ffl
&	b	c		d								fi	Thin Sp.
j	l	m		n		h	o	Middle Spaces	,	f	g	N Quad	M Quad
k													
q	y	u		t		Thick Spaces	a	r		;	:		
h s										.	-		Large Quads

IMPROVED LAY FOR BOOK AND NEWS WORK.

script or “copy” is usually placed, so that this is disturbed much less frequently than when the lay is according to the old system. The advantage of having the capitals and the figures placed as they are is obvious.

The changes in the lay of the lower case are considerable, though all the large boxes are tenanted by the same letters

as before. The following reasons are given for the variations that have been made:—

The middle spaces are laid in the old *y* box, and thus the distance between them and the thick spaces is lessened by one half. The thin spaces, instead of being mixed with them, are in a separate box just over the *em quad* box.¹

The *v* takes the box hitherto used for the thin and middle spaces. It is thus brought closer to the *e*, *i*, *s*, and *o*, these being the letters with which it is most frequently combined.

The *y* is placed in the old *v* box, directly under the *l* and *b*. The large number of words ending in *ly* and *bly* is the reason for this alteration.

The *q* is brought from the right to the left hand side of the case. In its new position it is brought close to the *u*, without which it is never used.

The *j* is also placed near the *u*, to which it comes next in about 200 words.

The *k* is brought from the upper to the lower case, to which it really belongs, to the saving of time and trouble.

The *x* is placed next above the *e*. These letters are combined in no fewer than 600 English words.

The comma, semicolon, colon, full point, and hyphen are all brought together.

This lay of the case is now adopted in a large number of offices, and has received the warm approval of the Caslon Foundry. It ought, in fact, to supersede all others, and in time it will probably become the standard lay of the cases for the English language.

The third lay shown is one which will be found in many offices, especially provincial newspaper offices, but is by no means as good as the one just described. It is, however, a

¹ It is said that this very simple rearrangement of the usual position of the spaces alone reduces the distance travelled by a compositor's hand no less than *half a mile* in the space of an ordinary working day.

great improvement on the first, and has many merits. It is sometimes varied by putting the middle spaces in the *y* box and the *y* between the *o* and *p*; and by putting the hair spaces in the \$ box and the thin spaces in the £ box, relegating these characters to other positions in the upper case, and in some other minor ways.

Upper Case.

								¼	½	¾	⅓	⅔	¢	l
*	†	‡	@	¥	lb	ss		½	¾	⅓	⅔	½	l	?
||	\$	¶	~	—	Æ	Œ		ff	ff	æ	œ		Æ	Œ
A	B	C	D	E	F	G		A	B	C	D	E	F	G
H	I	K	L	M	N	O		H	I	K	L	M	N	O
P	Q	R	S	T	V	W		P	Q	R	S	T	V	W
X	Y	Z	h.s.		J	U		X	Y	Z	\$	£	J	U

Lower Case.

fl	ff	fi	—	) ;		y	1	2	3	4	5	6	
&						i		s		f	g	7	8
,	b	e		d	e							9	0
j							Thin Sp.					En Quad	Em Quad
k	l	m		n	h	o		p	,	w			
z					Thick Spaces.								
x	v	u		t		a	r		q	:		Large Quads	
									.	-			

ANOTHER LAY.

Lays for Job Work.—Job types are laid in the special cases made for them, or in upper and lower cases, in double cases, or in half cases, according to the extent of the founts. When upper and lower cases are used, the lay is according to the book work lay adopted in the office; when double cases are used, the upper-case boxes (see p. 92) are devoted to capitals and figures according to the right-hand half of

the book work upper-case lay, and the lower-case boxes are laid just as if they formed a separate lower case. Half cases are laid according to the right-hand half of the book work upper case. When the improved jobbing case mentioned on p. 94 is adopted, the lay is that shown in the annexed diagram.

A	B	C	D	E	F	G
H	I	K	L	M	N	O
P	Q	R	S	T	V	W
X	Y	Z	Æ CE	£	U	J
I	2	3	4	5	6	7
8	9	o	.	:	!	-
,	;	?	'			

IMPROVED JOBBING UPPER.

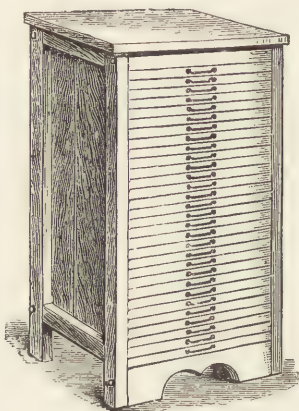
The Keeping of Wood Letter.—Much the best way of keeping wood letter is to place the types in order in trays, which are kept in a cabinet. Other ways are to keep it on shelves, or in specially constructed racks affixed to the walls



WOOD LETTER CASE.

of the composing room. A plan recommended by the Caslon Foundry is as follows: The letters stand on flat shelves, edgewise, like books in a bookcase, but in grooves formed by strips of deal about the size of narrow furniture,

placed sufficiently apart to allow them just to slide in, one behind another: A's in the first groove, B's in the second, and so on. The strips of wood keep the letter from falling, and provide room for the fingers of the compositor; whilst a free circulation of air all round the wood preserves it and checks warping. The depth of the shelves is determined by the number of E's to the fount to be placed thereon, that being the sort of which there is the greatest number to a fount. Every groove should be labelled or marked with the



WOOD LETTER CABINET.

letter it is intended to hold. In this way all founts of wood letter, no matter of what size, can be ranged on shelves of a uniform length of six feet, allowing for capitals and figures stood up, and a box on the right hand for points. The lower case of a fount should be ranged on a similar shelf underneath that containing the capitals. No sides are necessary, simply upright supports of wood fastening them against the wall the required distance from one to another. Shelves can be added any time, and placed as close as possible to one another, leaving only room for the com-

positor's hand to reach the back letters. The smallest letter should be placed lowest, the next size above, and so on up to the ceiling if necessary, where the largest letter on the widest shelf will overhang.



WOOD LETTER SHELF.

Keeping Metal Poster Types.—These are kept in cases, ordinary or sanspareil. The ordinary upper case should never be used for anything larger than great primer capitals, for it cannot hold the proper proportion to the lower case, even if the small capital side be pressed into the service. It is best to use an “Improved Jobbing Upper Case” (p. 94) for the capitals. If the fount is small, and consists of caps and lower-case letters, both may be put into an ordinary lower case, each of the larger boxes being divided horizontally into two by brass rule or reglet. The types, when larger than two-line pica, should, when distributed, be *set up*, and not thrown in pell-mell, otherwise the faces are apt to get injured.

CHAPTER XIV.

THE PRACTICAL ART OF COMPOSING.—The Compositor—How he should work—Learning the Lay of the Cases—How to set up a Head-line.

Composing is the art of arranging types in such order that, when fastened up and inked, and pressure is employed, they form, on paper or other material, such words and sentences, or designs, as may be required. The worker who performs the operation is called a *Compositor*. His craft includes a large number of exceedingly delicate processes, requiring long training, much manual dexterity, quickness of eye, and clearness of brain.

Composing is also called "type-setting;" a compositor is a "type-setter," and literary matter duly composed is said to be "set up." A case of type which has been nearly exhausted by being composed is referred to as being "set out." Indeed, in the everyday language of the printing office, the two-syllable word "compose" is nearly always superseded by the simpler monosyllable "set," as, "set it in long primer." We sometimes hear of "picking up stamps," and the Americans talk of "type-slinging;" but these are both slang expressions and therefore objectionable.

In describing the process of composing we shall suppose that the reader knows no more of the art than he has learned from the foregoing chapters. He should be cautioned, however, on the threshold of this operative section of his work, that mere reading and study cannot possibly render him a good workman; they must be supplemented

by patient and protracted practice. Written instructions may point out the best way to go to work, and may prevent the contraction of bad habits which experience shows young printers are liable to acquire, but they can do little more.

The first requisite in a composing room is ORDER. Everything should have its proper place and be kept in it; every workman should have his own duty and do it without impeding or otherwise interfering with his neighbour. Above all things, the types must be kept from getting into disorder, or into wrong places. When they are so they are said to constitute "pie," and generally in a printing office things in confusion or out of order are said to be "in pie." Thus: if a case is violently shaken up, and the letters get into wrong boxes, the case is said to be "in pie;" if composed matter gets thrown into a state of confusion, it is "pie." A little heap of letters, spaces, and quads will be called "pie." The amount of "pie" there is in an office is the gauge of the regularity and care of the workpeople engaged in it, and of the system under which it is managed.¹

Expedition is also necessary, but here we must again caution the reader; let him not for some time trouble himself about speed in working. It is undoubtedly essential in a compositor, but if everything is done properly it will come naturally; should it be sought by doing things carelessly, the maximum of rapidity will never be attained, while the work throughout will be of an inferior character. Let it be remembered, too, that in learning any art the first steps are of paramount importance: "Well begun is half-done."

The preceding paragraphs will have suggested the three chief qualifications of a good compositor—that he does what is required of him with ORDER, with EXPEDITION, and with ACCURACY. The man who cannot pursue his vocation in

¹ "Floor-pie" is, as the words indicate, "pie" made by letting types fall on the floor of the office and remain there.

this manner is a trouble alike to himself, his fellow-workmen, and his employer.

We will now assume that the reader has executed his indenture of apprenticeship, and having entered the composing room and been introduced to his future companions, is about to begin work. We will address him personally, as the colloquial mode is the best for imparting instruction.

Beginning Work.—Select a frame suited to your height; take care that it is not too low, for it is all-important not to stoop over your work. The pulmonary weakness of compositors is usually owing to the contraction of the chest induced by bending the body over a low case. Stooping, too, is a habit that, if once acquired, is seldom or never got rid of.

On the other hand, the frame should not be too high, or you will be compelled to throw out your arms or to stretch yourself to such a degree that you will be unnecessarily fatigued. Neither will you be able to work with such dexterity as you would if the frame were properly proportioned to your height. As a general rule it may be taken that the height of the frame should be such that the front bar just reaches your elbow. Any difference more or less must be neutralised by raising the case or by putting a box or board under your feet.

Now place a lower case moderately filled with letter on the frame, laying it down gently, otherwise the types will be jerked out of their boxes, or get into those of their neighbours. Take an upper case and place it on the frame, higher up than the lower case. The two will slope, desk fashion, the upper one being inclined as provided for by the back bar of the frame.¹

If you have to take a case out of a rack, draw it out only a few inches—say half-way. Then grasp it by the sides and

¹Consult the illustration on p. 13.

so hold it till you have put it on the frame. Never carry cases by holding them at the top and bottom. The direction may seem unnecessary, but we have known beginners to require being so instructed.

The cases having been placed in their proper position, the next thing to do is to learn the "lay." Plans have been given in Chap. XIII. Go carefully over the different boxes, and see if their arrangement corresponds with one of those there described; if there is any variation—and the probability is that there will be—note it particularly, or you may make serious mistakes. In well-regulated establishments new hands will always be supplied with diagrams showing the lay adopted in the office.

In taking a general survey of the letters contained in the respective boxes you will notice that some of them are alike, or appear so. Thus, a small capital o appears similar to a lower-case o; but if the one were used for the other in printing the difference would be at once apparent. The same may be said of the cypher 0 and the capital O; the small capital v and the lower-case v; the small capital w and the lower-case w; the small capital x and the lower-case x; the small capital s and the lower-case s. As already stated, it is the custom now to give those small capitals liable to be thus mistaken an extra nick on the back of the shank.

Owing to the form of the letters being necessarily reversed in the types, there are some of them which may confuse a beginner. They are the n and the u, the b, d, p, and q, the last four getting at first dreadfully mixed up. You should mark carefully the difference, and will soon learn to know "which is which." The experienced compositor detects the difference instantaneously, and almost as if by intuition.

There are several ways of "learning the cases," or "learning the boxes." You may learn them by rote, from a plan such as we have given, or you may learn them experi-

mentally, by actually beginning to compose. Our own experience leads us to the conclusion that, though it is very desirable that, before beginning to set, the positions in the cases of the principal characters should be learnt from a book of instruction such as this, it is not necessary, or even desirable, that the location of every letter and sign should be committed to memory before actual composition is commenced. Anyhow, it is advisable, for several reasons, that a printed plan of the lay of the case that is adopted should be given to the beginner. Large letters, with the face upwards, are sometimes placed in the various boxes, to show their proper contents.

In some printing offices boys are taught to compose in a manner different from that upon which we are now entering. A handful of letters is given to them, and they are told to put each in its proper box in the case. When they can do this with some degree of readiness, they are shown how to "distribute," that is, they are given a portion of regularly composed matter, and told to return the different types of which it is made up into their respective places in the case. We hold that both of these plans are injudicious. In the first place, they tend to get the cases into "pie;" for mistakes must occur, and every letter deposited in a wrong box requires, at the cost of some trouble, to be taken out again, or it results in an error which must be rectified when the method of composition begins. Beyond this, there is good reason for first making the young compositor acquainted with the *constitution* of the matter he has in hand, with its component parts, and the manner in which they have been brought together. This he can only do by actually setting it up, by putting the letters in position, with the necessary spaces, points, and the other types which are used in making lines and sentences.

Let him, therefore, be at once provided with a piece of printed copy (this is technically called "reprint" copy), and

be shown how to set up one line. It is advisable that a type of moderately large body, such as small pica or long primer, should be given to him at first. A smaller letter is inconvenient to read and to handle; the ability to work on such small type as nonpareil should be left as an after acquirement.

Making up the Stick.—Your composing-stick will no doubt be “set” or “made up” for you. “Setting the stick” or “making up the stick”—the terms are synonymous—means adjusting the slide so that the space between it and the head is the exact distance or “measure” required, so that the lines of type composed will be of the proper length. The “measure” is nearly always expressed in pica ems, and when it is determined the following is the proper way to make up the stick: The screw of the slide is loosened and the slide is withdrawn from the head about the distance of the “measure,” according to the judgment of the compositor. Then he sets up, *sideways*, as many lower-case pica *m*’s as there are pica ems in the measure. Suppose the measure required is 18 ems pica; the slide of the stick will be withdrawn about 3 inches from the head, and then in the stick will be placed eighteen letter *m*’s, face up and

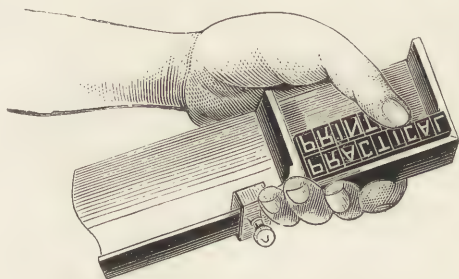


feet up alternately. These will be carefully counted (the alternation of face and feet assists the count) and then the slide is made to touch the line lightly, and is firmly secured in its place by the screw. If the measure is a long one, the distance between the slide and the head of the composing-stick should be longer than the line of *m*’s by about the thickness of a sheet of paper.¹ We will now resume the colloquial style.

Placing the Types in the Composing-stick.—Having got

¹ This is to allow for compression in locking up, a necessary allowance when the matter is leaded.

your cases in position, and your copy resting on the lower bar of the upper case, over a portion of that side occupied by the small capital letters,¹ and having obtained a setting-rule of the measure required (18 ems), take up the composing-stick in the left hand. Grasp it firmly, yet lightly, in the hollow of the hand, the thumb extended so as to rest on the end of the slide, at first—it must afterwards rest on the letters as successively taken up. The stick must be sloped so that a letter may rest against the slide on one side and the flange on the other.² Now take a



HOW TO HOLD THE COMPOSING-STICK.

lead of the proper measure and put it into the stick, close up to the flange.³ Then put in the setting-rule; this must be so arranged that the neb, or ear, is away from your body, and projecting over the head-piece of the flange. You are now ready to begin setting up the copy.

We will suppose that your copy begins thus :—

¹ This is not in all cases the best position for copy, as the lay adopted may require another arrangement. The copy should generally be placed at the left-hand side of the upper case.

² In the diagram the types are exaggerated in size, for the sake of showing more clearly their proper position in the stick.

³ Experienced compositors work without the lead, but it assists beginners in emptying their sticks.

PRACTICAL PRINTING.

Here is a line composed entirely of capital letters and a full point. The first letter is P, so with the forefinger and thumb of the right hand pick that letter out of its box and place it in your stick, with the *nick uppermost*. Acquire the habit of turning the letter during its journey from the box to the stick, so that it will be in its proper position when it arrives there. Try to select from among its fellows, at a glance, the exact letter that you intend to pick up; the slightest hesitation causes a loss of time, which, multiplied by the number of times the hand travels to the boxes in the course of the day, is a very serious affair. Let the left hand holding the stick follow the right hand to some extent, so as to diminish the space to be traversed by the latter before depositing the type. If these simple directions are followed, and resolutely adhered to, the art of setting type will be readily and pleasantly acquired.

The next letter is R; place that in the stick like the P, and then do the same with all the succeeding letters till you have put in the L, being careful all the time that the stick is not held in such a clumsy position that the types fall down. You will notice now that between the L and the first letter of the next word there is a blank. This must be made by inserting a *space*. In the line that is being set up the space seems equal to an en quad. Insert an en quad, and then set the letter P and the rest of the letters, placing after them the full point.

When the line is all set up you may fairly claim to have started on the road that leads to a complete knowledge of Practical Printing. But what a long journey has yet to be taken! For instance, you will find that the line does not fill up the measure. Your line is "short," and it requires to be exactly in the middle. In order to show you what is to be done, we will require you to fill out the line with em

quads. Probably it cannot be exactly filled with them, and leaves an empty space, but that does not matter for our present purpose. There is room for about eleven ems, and these, equally divided between the two ends, would leave about five and a half ems.

The spacing out would be as follows: At *a* place a 3-em quadrat, at *b* a 2-em quadrat, and the same at the other side. The line is still short, and must be made up with spaces. On experiment it will be found that there is about an em and an en short; divide this into two, or two ens and two middle spaces. Place one en at one side, and one en at the other; the spaces are to be placed in the same way. Accordingly at *c* there is the en quad, at *d* the middle space, and similar spacing at the other side.



In doing this you follow the rule always acted upon by a good compositor, and *let the largest space be on the outside, with the smallest space nearest the type.* The reason for this precaution is two-fold; the thinnest spaces, being the weakest, are most secure inside, where they are protected by their stronger neighbours, and thin spaces at the extreme end would be very inconvenient to handle when several lines are composed, and be liable also to slip out of their places.

Perhaps, after all, the line is "loose," although one thin space would make it tight. You are afraid of putting this in at one side lest the line should not be in the middle, and look one-sided. Well, if all your ingenuity in devising spacing at each end is exhausted, you *may* give a little more on one side. But let that side be the one opposite to the side which contains the full point at the end. The latter itself causes the line to have an appearance of being slightly one-sided, and the odd space may be inserted at the other

corresponding end without detracting from the appearance of the work.

You have now learned to set up a line. In book or newspaper work it would be called a "*head-line*," in jobbing work a "*displayed*" line, and so called in either case to distinguish it from a line of text or "*run-on*" matter, the composition of which will be the subject of our next chapter.

Before beginning the next line the setting-rule must be withdrawn, and placed on the line already set. Ere you do this, however, cast your eye over what you have done. See that all the letters are turned the right way, that none are standing with their feet where their faces ought to be, that all the nicks are turned in the same direction, so that they form a continuous groove through the entire line.¹ See that the types are straight upright, and close up to the flange of the composing-stick throughout their length; also that the largest spaces in the margins are outside and the smallest inside. If all these points have been attended to the line is as well set as any one could make it, and you are ready to begin another, of a more complicated character.

You must, as soon as possible, accustom yourself to read the types as they appear in the composing-stick. At first this is confusing, for everything seems upside-down, but after a little practice it will be quite easy. This is how they look:—

they look:—

after a little practice it will be quite easy. This is how this is confusing, for everything seems upside-down, but the types as they appear in the composing stick. At first

You must, as soon as possible, accustom yourself to read

¹ It is not, however, necessary, in practice to keep the spaces and quadrats all turned the same way, but to show the principles of composition the learner may be told to place them in the same order as the type.

CHAPTER XV.

COMPOSING.—Composition of a Common Paragraph—Indentation—
Spacing—Rules for Spacing—Emptying the Composing-stick—
General Hints.

Setting a Paragraph.—The young compositor is now initiated into the principle of the art of type-setting, but is able to apply it only to the most rudimentary description of work. In the present chapter we will endeavour to render clear to him the system upon which work of a somewhat more complicated character is to be done. We will suppose that the following is the first portion of the copy:—

All communications connected with the Literary portion of the *Register*, including New Books and Novelties sent for notice, should be addressed to the Editor.

Before picking up any of the types for this line, remove the setting-rule from the back of the first or title line already in the stick, and place it at the front (or against the nick side of the types), so that it may be at the back of the line which is about to be begun. It is only necessary to compose a few types without a setting-rule to perceive the convenience of using one.

Notice that the first line of the paragraph (compositors abbreviate the word to “par.”) is shorter than the two following, there being a white space at the beginning of it. This is called an *indentation*. The space is equal to that of an em quad, and must be obtained by using one; hence the line is said to be “indented an em.”

It may here be conveniently stated, although doing so is somewhat discursive, that a paragraph set up like that before the reader is called an ordinary or "common par." If the relative length of the lines were altered, by the first being begun at the commencement of the line—it would then be said to be "full out" or "run out"—and if the second and the following lines were indented, the whole would be a "hanging indention," because the first part of the first line would hang over the succeeding ones. To set a paragraph in this style, the compositor would be told to "run out and indent." This is an example of the valuable use of technical terms; the two words indicate with perfect distinctness what, without them, would take several lines to describe. An acquaintance with the technical terms of the trade conduces very much to the progress of the beginner. But he should always *think* over their signification; there is a distinct meaning, not always at once apparent, but certainly attached to nearly every phrase and word of the kind that is current.

But to resume. Place the em quadrat fairly in the stick, then set the capital A, and the two ll's which follow. Of course you will only put the latter in one by one, and not try to place the two at once; then put in a thick space to divide the word "All" from the word "communications" that follows. Proceed in the same manner in setting the remainder of the line.

Now, when the last word of the line, which is "the," has been set, the line will, let us suppose, be short. The line already set was short, but it was not required to be long. It had only to be placed in the middle of the line, or "centred" as it is called, and the remaining space was easily filled up with quadrats, etc.; but in ordinary book or newspaper work there must be no white space at the end of a line except at the end of a paragraph; in other words, each line must be "full out" at the end, *i.e.*, a letter or a

point must touch the head of the composing-stick; how is this line to be made so?

Justifying the Line.—There are three ways of making the line of the full length. One is to put more letters in, that is, to include a portion of the following line. Part of the word *Register* would fill it up. But there are certain laws that bear upon this part of the business which must not be infringed. In the first place, whenever a word is broken or divided, a hyphen must be inserted to indicate the fact. Place the hyphen at the end, for the sake of an experiment, and it will be found, perhaps, that there is room for the R.¹ It would not do to let this letter stand alone at the end, and to begin the next line with *egister*. That would be unsightly, inconvenient for reading, and contrary to the laws of syllabication. These latter laws we will refer to presently. The least we could do is to “get in”—a technical term again, which is amply explained by its present connection—the syllable *Re-*. We will suppose that this is impracticable, that there is no room for the *e*. Yet the line must be a full one; how is it to be made so?

The least consideration will show that the line can only be made full by putting a wider space between the words. This brings us to the important subject of *Spacing*.

Spacing is the art of putting the proper spaces between words, with a view to securing the most symmetrical appearance, while making the line of a proper length. In poetry every line differs in length, and all that is usually necessary is to get the words as far apart as will give them a neat and orderly appearance. But in prose matter, which is “run on” like that in the paragraph now to be set, the lines must all be of one length. This uniformity of length is obtained by the use of spaces of various thicknesses.

¹The experienced printer will perceive that we are only assuming some of these details for the purpose of making clear to the young compositor the mode of acting in certain contingencies.

The compositor has ready to his hand the following spaces—the hair space, the thin space, the middle space, the thick space, and the en quad, which, for this purpose, may be regarded as one of the spaces. It has been previously stated that *a 1-em quad is equal to two en quads, or three thick spaces, or four middle spaces, or five thin spaces.* This should be impressed upon the mind, and the relative thicknesses of the spaces to each other will be understood, thus:

*1 em = 2 ens = 3 thick spaces = 4 middle spaces = 5 thin spaces.*¹

The art of spacing is simply this: ascertain how much space there is at the end of the line, and divide that by the number of openings between the words. If there were an opening equal to two ems to space, and eleven words in the line, there would be ten openings, and as (by the formula above) ten thin spaces are equal to two ems, ten thin spaces would be used, in addition to those already inserted. If with the same vacant space there were only seven words (six openings), thick spaces would be used, for six of them would just extend the line to its proper length.² It is by this means that modern printers render all their lines uniform in length.

Spacing requires some ingenuity and thought, and the most careful attention should be paid to it by the young compositor. When he has mastered the principle involved, all the rest is a matter of calculation and judgment. He will put in more or less space according to the exigencies of the occasion. He may have to take out his thick spaces

¹ To practise the art of spacing in its simplest form follow this rule.

² We do not, however, recommend the use of a thin space with a thick in ordinary work, the remarks above being intended to show only the principle involved. Instead of a thick and a thin in five places we would put a thick and middle in two, and an en quad in three, which would measure the same. Of course we would choose the best places for each sort, according to a rule to be stated presently.

and substitute thin ones to "get in" a few extra letters; or he may have to put in thicker ones, or to add thin ones to those already in use. It is just like dividing a sum of money equally among a number of persons, each of whom is to have the same coins; if there were a pound to distribute between ten persons, each person would get a florin and receive his full allowance; if the pound had to be divided among only eight persons, each would get a florin and a sixpence, or a half-crown. So in spacing.¹

It was suggested nearly seventy years ago by Alexander Wilson that all spaces and quads should be specially nicked in the middle of the shank so as to be easily distinguished, and Messrs. Caslon in their *Circular* have strongly recommended this course. Where the plan is adopted the spaces and quads of the different book bodies bear nicks as follows:—

English	- 3 nicks.	Long Primer	3 nicks.	Minion	- 3 nicks.
Pica	- 2 „	Bourgeois	- 2 „	Nonpareil	2 „
Small Pica	1 „	Brevier	- 1 „	Pearl	- 1 „

A compositor can thus at sight tell to which body any space or quad belongs. This system should be universal.

¹ As we have already stated, the hair space is not always of uniform proportion to different bodies. It varies in thickness in different bodies from seven to ten to the em. It is, however, desirable to use as few as possible of these spaces. They are so thin that they are easily bent or broken, and careless compositors soon use up all the apportioned quantity of them to a case. They are really very seldom required; a little calculation will show how to avoid them altogether, in most cases, by using, at some part of the line, without detriment to the general appearance, one or two spaces rather thicker than the rest, the extra thickness being equal to the hair space. Besides the spaces enumerated, in America they have a so-called "patent space," which is in thickness midway between a thick space and an en quad. Such a space would often be convenient. Practical printers, however, are very reluctant to increase the number of pieces in their cases, and with very good reason.

The appearance of all composition depends greatly upon the character of the spacing, and there are certain rules laid down for the purpose which must never under ordinary circumstances be infringed.

Rules for Spacing.—*First: There must be, as far as possible, an apparently equal space between all the words in a line.* Observe we say “an apparently equal space.” This means that you do not always put the same sized space (*e.g.*, a middle space) between every word, but you have regard to the forms of the letters ending and beginning words. For instance, there may actually be less space between o and d than between l and h, yet the apparent space will be the same. Example:—

Motto denotes

will have

A thin space divides the first two words, a middle space the second two, yet the spacing appears about the same.

Long parallel upright-bodied letters always require more space between them than those which are curved and short. Where there is an overhanging kern, as f, at the end of a word, if the word next to it begins with a short letter, less space is required than when a long full-bodied letter follows, and *vice versâ*. If a comma is placed after a word the space following may be less than between words with no such point. This leads up to another rule.

Rule Two: The spacing after the grammatical and rhetorical points varies, in order to conduce to the apparent uniformity of the whole. In this country we do not put a space before the comma, whereas on the Continent they always do so. We put in a space, for instance, between the word and the semicolon, the colon, the note of interrogation, and the note of exclamation, as the case may be. The following is a general rule in regard to these, subject, however, to the exceptions that will hereafter be specified:—

Put :

Before the , . - ' and) - no space.

Before the ; : ? and ! - a thin or hair space.

After the , . - and ' - a *thin* space if the general spacing is with middle spaces, a *middle* if the general spacing is with thick spaces.

After the ; :) ? and ! - a *thicker* space, generally, than the rest of the line.

The latter direction is acted upon, not for the purpose of securing uniformity in appearance, but because a short break should, it is thought, be left after an ordinary phrase.

The rules require for their observance not only discretion and calculation, but taste, on the part of the compositor, and show, if it were needed, that setting up types is not the mere mechanical operation that persons unacquainted with its intricacies might imagine.

It should be distinctly understood, however, that these rules are not inflexible. They are sometimes impracticable ; especially when the lines are very short, or the words very long. In such cases the observance or non-observance of the rules depends upon the judgment of the workman ; necessity governs all things.

The spacing, in short, must be uniform in appearance throughout the line, except that at the close of some phrases a little wider space may be permitted. If the line cannot by any exercise of ingenuity be uniformly spaced, it may be a little wider in the *middle*.

Large types, such as those used in placards, are spaced by putting furniture, quotations, reglet, leads, or even pieces of card, between the words.

In poetry a thick space is generally used throughout ; but if the lines are wide apart or leaded, more space will be required, according to our next or *third* rule.

In setting the example of copy chosen for this lesson, we directed the young compositor to begin with a *thick* space. This space is, in fact, generally used for the purpose; it may be said to be the *normal* one. But if the matter of which this line was the commencement were in large type or were leaded, a thicker space should be placed between the words. Hence

Rule Three: The spacing between the words must be regulated proportionately to the space between the lines.

Solid matter—that is, matter which has no space or leads between the lines—is to be less widely spaced than matter that is “open” or leaded. If in the one case thick spaces were used, in the other en quads would be used. Here, again, the judgment and taste of the compositor find an opportunity for their exercise. As much as an em space may be used when the page is very large, the type large, and the lines very open. No exact rule can be given in regard to this requirement; much must be left to the judgment of the compositor. To cultivate his taste, let him carefully study good examples of printing, which are accessible enough at the present day.

In ordinary book work no pains whatever should be spared to ensure good spacing. We would impress this upon the young beginner, and advise him from the outset to determine to do his work in this respect as well as he possibly can. In hurried work, such as on newspapers, good spacing is almost impossible, and its appearance suffers accordingly. Sometimes great “holes,” or “pigeon holes” as they are called, are seen between the words of a newspaper paragraph, but how unsightly they are! In book printing they would be avoided at any cost of time or trouble.

In very short lines, such as those around an engraving, it is permissible, when no other expedient is practicable, to put a space *between the letters* of a word, in order to make the line the proper measure.

The compositor should not space up his lines so tightly as to make it a matter of difficulty to take them out of the composing-stick. Nor, on the other hand, should they be very loose. If too loose, two evils will be experienced: the lines will not appear uniform in length, nor can they be easily "lifted" out of the stick. If all have been spaced to a uniform length, the stick may be emptied, a dozen or more lines together (in the way that we shall describe hereafter), almost as safely as if the whole consisted of one piece of metal. Young compositors often thrust in spaces by main force, with a bodkin or piece of rule. The result is that the space is broken in halves, one part of it only remaining between the words. Besides this, it is a matter of great difficulty to get the lines out of the stick afterwards, and if all are not spaced equally tight, the probability is that some will drop out in the process.

The following table will show the various widths of space that can be put between words by the employment of the three kinds of spaces and the en and em quads, or combinations of two of them, the relative distances being indicated by the number of sixtieths of an em given:—

	60ths of Em.		60ths of Em.
Thin space (5 to em) - - -	12	Thick and thin - - - -	32
Middle space (4 to em) - - -	15	Thick and middle - - - -	35
Thick space (3 to em) - - -	20	Two thick spaces - - - -	40
Two thin spaces - - - -	24	En quad and thin space - -	42
Thin and middle - - - -	27	En quad and middle space -	45
En quad (= 2 middle spaces)	30	En quad and thick space - -	50
Em quad (= 2 en quads) - -	60		

Setting the Paragraph, continued.—The rest of the paragraph to be set needs but little remark. After each line, take out the setting rule and place it in position for beginning another.

The word *Register* is set in italics; these letters must, of course, be got from the italic case, which will generally be found either in the rack in the frame or with other italic

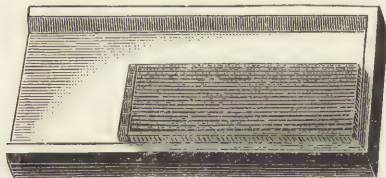
cases in a frame set apart for them ; if there are words in small capitals, these are to be got from the upper case of the Roman in which the whole is being composed.

At the end of the paragraph there is a very large blank. This is to be filled up with the aid of quadrats, beginning at the end of the line with four ems, and then using lesser ones and spaces until the line is the same length as the rest. The compositor must in this case remember the direction given in regard to the display line selected as the subject of the last chapter, and place *the smallest spaces nearest to the type*.

The present chapter will have shown the reader how to set up in a proper manner any ordinary kind of "straight-forward" composition, and how to do this in the most tasteful manner. It will have shown him, too, that a compositor is not a mere "type-lifter," as some persons regard him.

Copy.—The matter required to be set up, whether written or printed, is called "copy ;" written copy is called "manuscript" (written "MS.") and printed copy "reprint." If in the copy any word is underlined *once* it is to be set in italic, if underlined *twice* it is to be set in small caps, and if underlined *three times*, in full caps.

Emptying the Composing-stick.—A little before your stick is completely full of lines of type you must empty it.

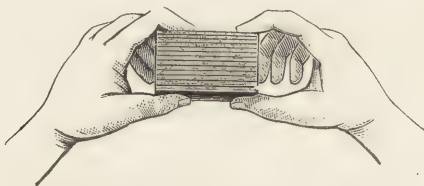


GALLEY WITH COMPOSED MATTER.

This is a rather delicate operation, and one that always troubles young compositors. If it be not properly done the matter will probably become pie. Set up a galley on the

left-hand side of the lower case you are working at. The head should be towards you, and the side with the bevel against the lower ledge of the case. This is done so that the types may be supported, when on the slope, by the head and lower side of the galley, as shown in the diagram on the opposite page.

Now set down the composing-stick on the lower case, in such a manner that the lines may run diagonally to the front of the lower case. Place the setting-rule in front of the last line, and a lead of the same measure as the stick behind the first line. Experienced compositors need not use the lead, but beginners should for safety always avail themselves of its protection. Raise the two hands and partially close them by bringing the tips of the fingers within about an inch of the palms. Open the thumbs and first fingers a little, preserving the other fingers in the same position. Press the two bent second fingers against the right and left side of the type respectively, and clutch it at top and



LIFTING TYPE FROM COMPOSING-STICK.

bottom between the first fingers and thumbs. You will find that you have a firm hold of the type, which will be supported on all sides. Raise it up gradually, but without hesitation, disengaging the stick by thrusting it away with the little finger of the left hand. As soon as possible turn the mass of type in such a manner that the lines may be on the top of one another, that is, so that all rest upon the first line secured by the lead. Bring the whole to the galley,

retaining your tight hold of it all the time, and then place it on the galley. If this be done carefully not a single letter will have dropped out. It is a good plan to practise by lifting out, first one line, then two, then three, and so on until the whole stickful can be lifted out with confidence.

After practice, the lead may be dispensed with, but then the matter should be turned the other way, so as to rest upon the bottom line and the setting-rule.

Place the matter on the galley, or "drop it," to use the technical term, as close to the head as possible, and then push it right up. A lead and a clump or quotation may be put at the foot of it to protect the bottom line.

The difficulty of emptying the stick will be materially increased if the lines have been set too tightly. On the other hand, if they have been set too loosely, there will be also great difficulty in emptying the matter, as some of it will be likely to drop out. In either case the importance of careful setting and proper justification will have been manifested.

Reading over.—It is a good plan for the young compositor to read over each line in his stick before he commences a new one, and to correct any error which he perceives he has made. This may be conveniently done while justifying the line or spacing out. Many compositors read over their matter on the completion of every stickful, believing that to do so is a safe and economic practice, saving much time in correcting after a proof has been pulled. Others dispense with this reading in the stick altogether. We need not here enter into the discussion as to which is the preferable course, but we lean decidedly to the plan of reading in the stick as the successive lines are set up.

Leading.—If matter has to be leaded, the leads, which of course have to be of the same length or measure as the lines of type, are always put in while the type is being composed, a lead being inserted in the stick after each line is finished,

though if the leads are not handy at the moment the compositor can insert them when the type is on the galley, each line being pushed up a little to allow for the lead or leads after it. The leads chiefly used for matter set in types from nonpareil up to small pica are 8-to-pica leads, which are also called "thin leads," and matter so leaded is said to be "thin leaded;" 4-to-pica leads are called "thick leads," and matter so leaded is said to be "thick leaded;" when 6-to-pica leads are used the matter is said to be "6-to-pica leaded," and sometimes, but seldom, "middle leaded;" and when each line is separated from the next by two 6-to-pica leads or two 4-to-pica leads the matter is said to be "double six leaded" or "double thick leaded." Whenever a book is leaded it should be leaded throughout in the same way: it is very bad style to vary the leading. In newspapers, however, it is not uncommon to see some parts leaded and some solid, and also to find an article started with leads and continued solid after the first ten or twelve lines.

Additional Rules for Spacing.—The following instructions as to spacing are those acted upon in the printing-house of Mr. Theo. L. De Vinne,¹ slightly modified to accord with English practice:—

The spacing of words must be governed by the leading. Solid matter and thin-leaded matter, in ordinary faces of Roman and italic, should usually be spaced with thick spaces. When about to divide a word in matter of this character prefer to take in.²

Ordinarily leaded matter and poetry should be spaced with *en quadrats*. When about to divide a word in thick-leaded or double-leaded matter, prefer to drive out.³

On double-leaded matter two thick spaces may be used. But however widely leaded-out any matter in regular Roman body may be, avoid the use of more than two thick spaces. Sometimes wider spacing will be passed, but pigeon-holed matter is always objectionable.

¹ See preface.

² That is, reduce the spacing and get in more letters.

³ That is, increase the spacing, and have fewer letters in the line.

Thin-faced, lean, and condensed letters call for close spacing ; an expanded letter should always be widely spaced and widely leaded.

Lines of round-faced capital letters, two-lines with little or no beard, and the lower case of all extended letter should have at least two thick spaces between words. The en quad must be used as the space for very expanded letter.

All lines of composition must be justified so that they will stand unsupported in the stick. Those who "make up" must refuse to make up matter that is too short or too long for the leads. The expense of re-justifying slack matter must be borne by the compositor in fault. He may be also held responsible for damages or expenses that may be incurred by the pulling out of the letters on the machine by the rollers, or delays made by type working off its feet¹ in slackly justified matter that may have escaped detection in making up.

Mr. Hailing, of Cheltenham, writing on this subject, says : As uniform spacing is a *sine quâ non* in bookwork, and as the compositor has also to study expedition, he would save himself a world of time, trouble, and annoyance if he were to keep in view the relative thick-nesses of the ordinary spaces, and when he had set as many words (thick-spaced) as his line would take, adopt the most likely space to evenly justify it. No doubt every compositor knows that two ens equal one em, but there are thousands who do not know that three thick, four middle, or five thin spaces equal one em. Now, let the compositor keep this simple fact in view, and call his spaces "threes," "fours," "fives." Let him set his line, and suppose it needs an em to justify it ; that gives him five thin spaces ; and if there are in the line words ending in tall letters, d, f, i, l, or, better still, tall letters ending one word and beginning the next, then an extra thin space may fairly be inserted, and supposing five of these occur in the one line, then his five spaces do the business quickly and well. Long words, too, should be indulged with an en quad or extra thin space ; but if that line is composed entirely of short words, he must, to make his work anyway neat, break up his thick spaces into double-thins. Do not use hair spaces if you should happen to discover any the week after the fount has been laid ; but treasure them up as you would gold filings or diamond chippings, for verily you will find them a boon and a blessing in some dire need or unforeseen emergency. They are intended for letter spacing.

¹ When type is slack, it does not stand perfectly upright, and is said to be "off its feet."

To set very short measures, such as ten-ems brevier, make up the stick to thirty ems, drop five four-em quads in the end of the stick, justify up to them, and proceed with the composition. When the stick is full, empty it in the usual way, and then remove the quads. It does not, of course, matter what body is being worked on, the addition of a few of its own quads rendering the setting of the short measure quite simple.

CHAPTER XVI.

COMPOSING (*continued*).—Setting from Manuscript—Spelling—
Division of Words—Punctuation—Contractions.

Setting from Manuscript.—We have hitherto dealt with setting line for line from reprint copy. This is the easiest of all kinds of composition, for, as regards spelling, spacing, punctuation, and division of words the compositor has simply to follow the copy before him. It is seldom, however, that he has this easy work; for the most part he has to set from manuscript, and this, alas! is more often than not ill-written, badly punctuated or not punctuated at all, and sometimes faulty in spelling. A compositor must therefore learn (1) to decipher manuscript, (2) to spell words both common and uncommon, (3) to know how to divide them, (4) to punctuate properly.

The deciphering of bad MS. can only be mastered by constant practice. The beginner should pass from reprint to legible manuscript copy, and thence by degrees to what is all but illegible. He should lose no opportunity of studying the different kinds of handwriting which come into the printing office, so that when called upon to set from bad copy he may be able to do so. He must also remember that many writers contract words freely, especially slurring terminations, thus: "necy." is written for "necessary," "opportunity." for "opportunity," "hndwg." for "handwriting," "reqd." for "required," "mnr." for "manner," "mt." for "-ment," "g" for "-ing," "y" for "-ity," "n" or "tn" for "-tion," and so forth. Journalists habitually write | for
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“the,” *t* for “that,” *o* for “of,” *w* for “with,” *wh* for “which,” and so forth.

Spelling.—As regards spelling, our reader’s elementary education will be sufficient for ordinary words, but a good compositor makes himself acquainted also with uncommon and even scientific terms, with the names of men and places, and with the common quotations from other languages. The reading of good current newspapers is very useful for the acquisition of this knowledge, and an acquaintance with some of the works of the best English authors is eminently desirable; indeed, the more generally cultivated the compositor’s mind is the better he will be able to discharge the duties of his calling. In any case he should be the possessor of a good English dictionary. Most works of this nature contain lists of Biblical, historical, and geographical names and a collection of familiar quotations from foreign languages, and the young compositor who desires to become proficient in his calling will do well to study them at his leisure.¹

Mr. Horace Hart, the printer to the University of Oxford, has compiled a set of rules for the guidance of the compositors and readers employed at the Clarendon Press, Oxford, and these have been revised as regards spelling by Dr. J. A. H. Murray and Mr. Henry Bradley, the editors of the great New English Dictionary now in course of publication by the university. As there can be no higher authority we give these rules, with the kind consent of Mr. Hart:—

Words ending in -able.—These are to be spelt without *e*, as—desirable, unmistakable, except when *e* is necessary to indicate the pronunciation of the previous letter or

¹ Butter’s *Spelling* (6d.) is still a favourite work; a more modern is the *Suggestive Word-building and Spelling Book*, published in penny parts by Blackie & Son. Of dictionaries, one of the best of the smaller works is *Annandale’s Concise Dictionary*, published by Blackie & Son at 3s. 6d.

letters, as—changeable, manageable, noticeable, serviceable.

Words ending in -ise and -ize.—These are to be spelt as follows:—

Use the *S* for advertise, advise, affranchise, analyse, apprise (to inform), chastise, circumcise, comprise, compromise, demise, despise, devise, disfranchise, disguise, emprise, enfranchise, enterprise, excise, exercise, franchise, improvise, incise, mainprise, manumise, merchandise, premise, reprise, surmise, surprise.

Use the *Z* for aggrandize, agonize, anatomize, anglicize, apologize, apostrophize, apprise (to appraise), authorize, baptize, brutalize, canonize, catechize, cauterize, centralize, characterize, civilize, colonize, criticize, crystallize, demoralize, dogmatize, economize, epitomize, equalize, eulogize, evangelize, exorcize, extemporize, familiarize, fertilize, fraternize, galvanize, generalize, gormandize, harmonize, immortalize, jeopardize, localize, magnetize, memorialize, mesmerize, metamorphize, methodize, modernize, monopolize, moralize, nationalize, naturalize, neutralize, organize, ostracize, oxidize, paralyze, particularize, patronize, philosophize, plagiarize, polarize, pulverize, realize, recognize, reorganize, revolutionize, satirize, scandalize, scrutinize, signalize, solemnize, soliloquize, spiritualize, stigmatize, syllogize, symbolize, sympathize, tantalize, temporize, tranquillize, tyrannize, utilize, vocalize, vulgarize.

The above spellings are those adopted in the New English Dictionary published by the University of Oxford.

Words ending in -ment.—In all cases insert the *e* in the preceding syllable—abridgement, acknowledgement, judgement, lodgement. (Dr. Murray is very emphatic on this point, and says the omission of it, which is unfortunately so common, is “against all analogy, etymology, and orthoepy;” he rejoices to find judgement properly spelt in the Revised Version of the Bible.)

Words of Doubtful Spelling should be spelt as follows :

Aërial, almanac, ankle, anybody, any one, anything, anywhere, apophthegm, apostasy, appanage, artisan, ascendancy, ay (always), aye (yes—the “ ayes have it ”), balloting, barque, battalion, befall, benefited, bethrall, bigoted, billeting, bluish, brier, by-and-by, by-law, by-the-by, canvas (cloth), canvass (political), carcass, cauldron, chant, chaperon, cheque (on a bank), chequered (career), chestnut, chillness, cider, cipher, clench (fists), clinch (argument), cloak (not cloke), cognizance, commonplace, connexion, contemporary, control, co-operate, dare say, demeanour, dependant (noun), dependent (adj.), dependence, develop, divest (law), disk, dispatch, disyllable, dote, downstairs, dullness, earrings, ecstasy, embarkation, empanel, empanelled, enclose, endorse, enroll, enrolment, ensconce, ensure (to make safe), enthrall, entreat, entrust, envelop (verb), envelope (noun), every one, everything, everywhere, expense, faecal, fantasy, favour, fetid, fidgeted, forbade, foregone (gone before), foretell, forgo (verb), for ever, frenzy, fulfil, fullness, galloped, gauge, gipsy, good-bye, gossiped, grey, haemorrhage, halfway, handbook, handiwork, holiday, honour, humourist, humorous, humour, ill health, india-rubber, indoor, inquire, inquiry, install, instalment, instil, insure (as in a society), Inverness-shire, etc., jail or gaol (as author prefers), jewellery, knick-knack, ladylike, lantern, licence (noun), license (verb), liquefy, loathe (verb), loth (adj.), lovable, mamma, mattress, meantime, meanwhile, mediaeval, midday, misdemeanour, moneyed, moneys, movable, negotiate, net (profits), noonday, no one, oneself, outdoor, overalls, partisan, pavilion, percentage, petrify, poniard, postilion, potato, potatoes, practice (noun), practise (verb), primaeval, prophecy (noun), prophesy (verb), putrefy, quartos, racecourse, rarefy, reappear, recall, recompense (verb and noun), recompose, referable, reimburse, reinstate (but re-enter, co-operate, pre-eminent, etc.), ribbon, rickety,

rigorous, rigors (in med.), rigour, riveted, schoolboy, school-girl, secrecy, seise (in law), seize (to grasp), sergeant (mil.), serjeant (law), Shakespeare, show, shrillness, sibilant, sibyl, sibylline, siphon, siren, skilful, some one, spadefuls, spoonfuls, stanch, standpoint, steadfast, stillness, story (both senses), stupefy, tallness, tease, tenor, textbook, tire (of a wheel), toilet, tranquillity, transferable, traveller, trousers, tumour, upstairs, vender (as generally used), vendor (in law), vermilion, villany, visor, wabble, wagon, weasand, wellnigh, whilom, whiskey, whitish, widespread, wilful, woful, worshipped, wrongdoing, zigzag.

Foreign Words.—The following lists show the foreign words and phrases most frequently met with in English literature; those in the first list have become anglicized by constant use and should *not* be in italics: Aide de camp, albumen, alto relievo, à propos, bas-relief, bazaar, beau idéal, bona fide, bravos, café, cantos, chargé d'affaires, chiaroscuro, débris, début, depot, diarrhoea, dramatis personae, employé, ennui, facsimile, fête, gratis, innuendo, innuendoes, litterati, manœuvre, mignonette, naïve, per annum, prestige, prima facie, protégé, rendezvous, rôle, savants, seraglio, sobriquet, vice versa, viva voce.

The following should be in italics: *Amour-propre*, *ancien régime*, *anglice*, *a priori*, *bonhomie*, *cheval de frise*, *confrère*, *cortège*, *coup d'état*, *coup de grâce*, *demi-monde*, *élite*, *en masse*, *en passant*, *en route*, *ex cathedra*, *garçon*, *grand monde*, *habitué*, *in propria persona*, *lapsus linguae*, *mêlée*, *mot*, *naïveté*, *ne plus ultra*, *pari passu*, *plébiscite*, *de quoi vivre*, *résumé*, *raison d'être*, *sansculotte*, *sans cérémonie*, *sine qua non*, *sotto voce*, *tête-à-tête*, *vis-à-vis*.

The Use of Diphthongs.—In many printing offices the diphthong sounds are always represented by the double letters, or diagraphs æ, œ, but many writers now prefer the use of separate letters. The Clarendon Press rule is: The diagraphs æ and œ should be separated in Latin and Greek

words, as Aeneid, Aeschylus, Caesar, Oedipus; and in English, as mediaeval. In old English and French names, however, it is incorrect to separate the letters, as Ælfred, Cædmon, manœuvre.

A or An.—The rule to use *an* before a vowel or silent *h* only is subject to a few exceptions: if the initial vowel be *u*, or its equivalent pronounced *you*, the article *a* should be used, while *an* should be placed before a word commencing with an aspirated *h*, if the accent is on the second syllable. Thus: A European, a ewe, a ewer, a hospital, a humble, a unanimous, a uniform, a union, a universal, a useful, a usurper; an heir, an heirloom, an herb, an herbal, an heroic, an historical, an honest, an honour, an honourable, an hotel, an hour.

The Use of the Hyphen.—In spelling compound words the hyphen (-) is sometimes used and sometimes not. It is customary to employ it (1) between the component parts of some compounds, in "man-of-war," "re-enter," "pre-eminent;" (2) to unite some numbers written in words, as "twenty-one;" (3) to unite fractional parts written in words, as "two-thirds;" (4) to show that a set of words are to be read together, as "peace-at-any-price principles;" and, as already stated, (5) it is always placed at the end of a line when a word is divided.

The Clarendon Press rules as to the use and omission of the hyphen are as follow: Hyphens need not, as a rule, be used to join adverbs qualifying adjectives, as in "a beautifully furnished house," "a well calculated scheme." But when the word might not at once be recognised as an adverb the hyphen is to be used, as "a well-known statesman," "an ill-built house," "a new-found country," "the best-known proverb," "a good-sized room." When the adverb qualifies the predicate the hyphen *should not* be used, as this fact is well known. Where either (1) a noun and adjective or participle, or (2) an adjective and a noun, in combination,

are used as a compound adjective, the hyphen *should* be used, thus, "a poverty-stricken family," "a blood-red hand," "a nineteenth-century invention."

Such compound nouns and similar words in familiar use, *having but one accent*, as armchair, birdcage, blackbird, bricklayer, byway, byword, hairdresser, handkerchief, hour-glass, mantelpiece, nowadays, seaport, teapot, watchcase, wheelbarrow, have each become from familiar use one word, and require no hyphen.

Compound words *of more than one accent*, as apple-tree, cherry-pie, gravel-walk, etc., require the hyphen, as well as those which follow : By-and-by, by-law, by-the-by, court-martial, cousin-german, easy-chair, good-bye, half-crown, half-dozen, never-ending, one-and-twenty, one-eighth, serio-comic, starting-point, step-father, title-deeds, etc.

Half an inch, half a dozen, etc., require no hyphen. Print fellow men, head quarters, head master, post office, stamp office, etc.

Division of Words.—One of the first difficulties encountered by the young compositor in setting run-on or paragraph matter consists in the necessity of dividing words which will not completely come into the line. Part of a word, perhaps, requires to stand at the end of a line with a hyphen after it, and part at the beginning of the following line—of course without another hyphen beginning it. It would not do, for the purpose of completing a line, to use just as many letters as would fill it up, for there are recognised rules for dividing words, which must be followed.

Our first advice to those about to divide is simply "Don't." If you can prevent it by altering the spacing, do so; but the spacing must not be glaringly different from that of preceding and following lines. In the best offices divisions of words are regarded as less objectionable than uneven spacing. If divisions are necessary, let them be as few as possible, and these few as carefully and correctly made as you are able.

The best point to aim at is a division which represents the proper pronunciation of a word, and at the same time exhibits its root. When a choice must be made between the two, the division which gives the proper pronunciation is usually preferred.

Rules.—1. Two successive lines ending with a divided word are unsightly, and seldom allowed, except in narrow measures.

2. Divisions in three successive lines should never be permitted except in very narrow measures.

3. A divided word should never end a page, if it be possible to avoid it.

4. A division that leaves but one letter at the end of a line or at the beginning of another is not permissible. Such divisions as “en-,” “de-,” or “in-,” are to be made only in very short measures, and small words of two syllables such as “into,” “until” are never to be divided unless the measure is so narrow that the division cannot be avoided.

5. A line must not begin with the last syllable of a word when that syllable is formed only of two letters.

Examples : Nation-al, teach-er, similar-ly—all of these are inadmissible.

Subject to these reservations, words may be divided thus :—

6. A consonant between two vowels belongs to the latter syllable. *Examples :* Ta-lent, fa-tal, le-ver, le-ga-cy, mo-no-po-ly. *Exception :* The letter x and single consonants when they belong to the former portion of a derivative word, as ex-ile, ex-ist, ex-amine, up-on, dis-ease, circum-ambient.

7. If two or more consonants are capable of beginning a word and form part of one sound, they must not be divided. When such occur in a word they belong to the latter syllable. *Examples :* Ta-ble, sti-fle, lu-cre, o-gle, mea-gre, stro-phe, de-stroy.

8. But when two or more consonants cannot begin a word, or when the vowel preceding them is short, the division should be made after the first consonant. *Examples* : Ab-bey, ac-cent, vel-lum, ab-ject, gar-den, laundry, pamph-let, blas-pheme, dis-tress, min-strel.

9. A prefix, or an affix, or a grammatical termination, may be separated, providing the root is left entire. *Examples* : Dis-con-tinue, en-able, trans-port, shear-er, load-ed, print-ing, false-hood, differ-ence, command-ment, king-dom.

10. Compound and derivative words are resolved into their primitives. *Examples* : School-master, hand-writing, pen-knife, snuff-box, looking-glass, arch-angel, geo-log-y, theo-cra-cy, ortho-graphy.

11. It is desirable that compound and derivative words should, at the end of lines, be divided in such a manner as to indicate their principal parts. Thus : school-master is preferable to schoolmas-ter, dis-approve to disap-prove, ortho-dox-y to or-thodox-y, though as regards the analysis of words into syllables the latter mode is unobjectionable. From the shortness of the printed lines in some books the principle recommended cannot always be carried out.

12. The terminations tion, sion, cial, tial, etc., must not be divided.

13. A syllable consisting of only one letter, as the a in cre-a-tion, should not commence a line. This word would be better divided crea-tion, and so all others of a similar kind.

There are exceptions to these rules, often owing to the pedantry of some authors and correctors of the press ; but for most practical purposes they will be sufficient.

According to the Clarendon Press rules, the following divisions are to be preferred : Abun-dance, corre-spon-dence, depen-dent, dimin-ish, estab-lish-ment, impor-tance, inter-est, minis-ter, pun-ish, respon-dent.

Such divisions as the following are to be avoided: Star-*va*-tion, obser-*va*-tion, exal-*ta*-tion, gene-*ra*-tion, imagi-*na*-tion, origi-*na*-lly: the proper division is starva-*tion*, observa-*tion*, etc.

The principle, says Mr. Hart, is that the part of the word left at the end of the line should suggest the part carried over. Thus the word "happiness" should be divided "happi-*ness*," not "hap-*pi*-ness."

Print Roman-*ism*, Puritan-*ism*, etc.; but Agnosti-*cism*, Catholi-*cism*, criti-*cism*, fanati-*cism*, tautolo-*gism*, witti-*cism*. [The obvious reason why the *c* or *g* is carried over in these words is lest it should be sounded hard when it ought to be sounded soft.]

Philo-*sophy*, atmo-*sphere*, tele-*scope*, tele-*phone*, micro-*scope*, should have only this division. But print epis-*copal*, etc.

Line Endings.—Beyond the rules for dividing words there are in good offices certain other rules as to the ending of lines. The Clarendon Press does not allow the article "a" or the pronoun "I" to end a line in ordinary full measure. Mr. Hart properly says, too, that "St." and "Mr." should never be separated from the name; nor must initials ever be divided, whether they stand for Christian names or for titles. "Mr. A. J. | Balfour" may stand for the sake of even spacing, but not "Mr. A. | J. Balfour." The contractions p. pp. are never allowed to stand at the end of a line in any measure.

Punctuation.—Punctuation is an art nearly always left to the compositor, authors being almost without exception either too busy or too careless to regard it. It behoves the compositor, therefore, to know how to use properly all the points and marks affecting literary composition. We reproduce below the instructions in punctuation given by Dr. Meiklejohn in his *Handbook of the English Language*, but if more extended information on the subject is required

reference must be made to one of the works specially written to deal with it.¹

The *Full Stop* (.) or *Period* marks the close of a sentence.

The *Colon* (:) introduces (1) a new statement that may be regarded as an after-thought; or (2) it introduces a catalogue of things; or (3) it introduces a formal speech.

Examples: (1) "Study to acquire a habit of accurate expression: no study is more important." (2) "Then follow excellent parables about fame: as that she gathereth strength in going; that she goeth upon the ground, and yet hideth her head in the clouds; that in the day-time she sitteth in a watch-tower, and flieth most by night."—(Bacon). (3) "Mr. Wilson rose and said: 'Sir, I am sorry, etc.'"

The *Semicolon* (;) is employed when, for reasons of sound or of sense, two or more simple sentences are thrown into one. *Examples*: (1) "In the youth of a state, arms do flourish; in the middle age of a state, learning; and then both of them together for a time; in the declining age of a state, mechanical arts and merchandise."—(Bacon).

The *dash* or *em rule* is used (1) to introduce an amplification or explanation; and (2) two dashes are often employed in place of the old parentheses. *Examples*: (1) "During the march a storm of rain, thunder, and lightning came on—a storm such as is only seen in tropical countries." (2) "Ribbons, buckles, buttons, pieces of gold lace—any trifles he had worn—were stored as priceless treasures."

The *Comma* is used to indicate a strong pause, either of sense or sound, but it is not to be inserted wherever a reader would pause. *Example*: "It is true that the comma is the weakest of all our stops; but there are many pauses

¹ *Stops, or How to Punctuate*, by Paul Allardyce, published by T. Fisher Unwin (6d., or cloth 1s.), is a work which has passed through several editions.

which we ought to make in reading a sentence aloud that are not nearly strong enough to warrant a comma."

It is better to under-stop rather than to over-stop. For example, the last part of the last sentence in the paragraph above might have been printed thus: "there are many pauses, which we ought to make, in reading a sentence aloud, that are not nearly strong enough to warrant a comma." This is the old-fashioned style; but such sprinkling of commas is not at all necessary.

Two things are all that are required to teach us the use of a comma: (a) observation of the custom of good writers; and (b) careful consideration of the sense and build of our own sentences.

The following are a few special uses of the comma: (a) It may be used in place of "and," thus: "We first endure, then pity, then embrace." (b) After an address or vocative case: "John, come here." (c) After certain introductory adverbs, as: however, at length, at last, etc.; thus: "He came, however, in time to catch the train."

The *Point of Interrogation* (?) is placed at the end of a question.

The *Point of Admiration* (!) is employed to mark a statement which calls for surprise or wonder, but it is now seldom used.

The Clarendon Press rules as to punctuation are as follows:—

Loose punctuation, especially in scientific and philosophical works, should be avoided.

Commas to be as a rule inserted between adjectives preceding and qualifying substantives, as "an enterprising, ambitious man;" "a gentle, amiable, harmless creature;" "a cold, damp, badly-lighted room." But where the last adjective is in closer relation to the subject than the preceding ones, omit the comma, as "a distinguished foreign author."

Points used with words in inverted commas or parentheses must be placed according to the sense.

Em rules.—Never put a point before an em rule, except at the end of a line in conversation matter, or at the end of a note before an authority, or at the end of a side heading.

En rules are to be used in such cases as 1880-1, and not hyphens or em rules.

Quotation Marks.—Single ‘quotes’ to be used for the first quotation; then double for quotations within a quotation.¹

Points and not asterisks should be used to mark omissions. Four points are sufficient, separated by em quads; and the practice should be uniform throughout the work, except where full lines are insisted on.

Other Rules for Setting.—We may here usefully deal with a few kindred matters affecting ordinary composition, and again we make free use of the Clarendon Press rules, believing them to constitute a proper standard for all kinds of work.

Contractions.—Set ain’t, don’t, haven’t, shan’t, shouldn’t, ’tis, won’t, close up, i.e., without a space before or after the apostrophe.

Put a thin space before the apostrophe in that’s (for “that is”), queen’s (for “queen is”), etc., to distinguish it from the possessive case.

Use the ampersand in the name of a firm, as Spottiswoode & Co.

Print lb., not lbs. Put no full point after 8vo, 4to, 12mo, etc.

Set Scripture references as follows: Gen. xi. 17; 1 Cor. xv. 26. Do not insert “chap.,” or “v.,” or “verse.”

¹This rule of the Clarendon Press is in many printing offices reversed.

In references set the titles of the Books of the Old and New Testament as follows: Gen., Exod., Lev., Num., Deut., Joshua, Judges, Ruth, 1 Sam., 2 Sam., 1 Kings, 2 Kings, 1 Chron., 2 Chron., Ezra, Neh., Esther, Job, Ps., Prov., Eccles., Song of Sol., Isa., Jer., Lam., Ezek., Dan., Hos., Joel, Amos, Obad., Jonah, Mic., Nahum, Hab., Zeph., Hag., Zech., Mal., Matt., Mark, Luke, John, Acts, Rom., 1 Cor., 2 Cor., Gal., Eph., Phil., Col., 1 Thess., 2 Thess., 1 Tim., 2 Tim., Titus, Philem., Heb.; Jas., 1 Pet., 2 Pet., 1 John, 2 John, 3 John, Jude, Rev. The titles of the Books of the Apocrypha are better set at length, except that we may set Wisd. of Sol., Eccclus., 1 Macc., 2 Macc.

References to Shakespeare's plays are best printed: 1 Henry VI., iii., ii., 14 (meaning Act 3, scene 2, line 14).¹ Most of the titles of the plays may be contracted thus: Coriol. (for *Coriolanus*), Cymb. (for *Cymbeline*).

Authorities at the end of quotations or notes are best printed thus: HOMER, *Odyssey*, ii., 15.

Set ad loc., e.g., i.e., et seq., *ibid.*, cf., q.v., etc., in roman.

When £ s. d. are used with sums of money, use the italic letters, and put a full point after the s. and the d.

The points of the compass, N., E., S., W., when separately used, are to have the full point; but NNW., ESE., are to be set close up without full points between the initials.

Unless specially ordered, set "north," "east," etc., in full, and not "seven miles N. of Oxford."

Print MS. (manuscript), not M.S.; PS. (postscript), not P.S.

Capital Letters.—Avoid capitals as much as possible, but use them in the following and similar cases:—

Act, when referring to Act of Parliament or the Acts of a play.

¹This is *not* the Clarendon Press system, which Dr. Murray stigmatises as bad.

Baptist, Christian, Nonconformist, Presbyterian, Puritan, and other denominational terms.

Christmas Day, Lady Day, etc.

House of Commons, Parliament, High Court of Justice, etc.

Her Majesty, His Royal Highness, etc.

Sir Roger, J. Spencer-Smith, Esq., Mr. J. Smith, etc.

Chandos Street, Trafalgar Square, Kingston Road, Belvidere Terrace, Westbourne Grove, Hatton Garden. [In directories, Fleet-st., Norfolk-sq., etc., are permissible.]

O Lord, O God, O sir; but Oh that, etc.

He, His, Thee, Thou, when these pronouns refer to the Deity; but never capitals for who, whom, except at the beginning of a sentence.

Use lower-case initials for the more common names derived from proper names, as d'oyley, hansom-cab, holland, may-blossom, morocco, roman, russia. Also for the following words: frenchify, herculean, laconic, latinity, latinize, tantalize.

Small Capitals.—The initials A. D., A. M., A. U. C., and B. C., before dates, are to be set in small caps, with a hair space between.

a.m. (ante meridiem) and p.m. (post meridiem) should be in lower case.

Dates in numerals are best set in small caps, thus: MDCCCXCV. or M.DCCC.XCV.

Italics or Inverted Commas.—In many works it is now common to print the titles of books in italics, instead of in inverted commas. This must be determined by the directions given with the copy, but the practice must be uniform throughout the work.

Extracts from foreign books should be printed in roman between inverted commas.

Names of periodicals and ships should be in italics. [This varies in different offices.]

See ante, p. 186, for foreign words, etc., which should be set in italics.

Figures and Numerals.—Print nineteenth century: not 19th century.

Use figures for money, weight, or measure. In other cases numbers under 100 to be in words: but set "90 to 100;" not "ninety to 100."

This rule should apply only to specific numbers; spell out in such instances as the following: "With God a thousand years are but as one day," "I have said so a hundred times."

Insert commas in four figures, as 7,642; but not in dates, as 1899.

Numerals are to be preferred in such cases as Henry VIII, etc.; the full point follows the numerals only at the end of a sentence. If the author prefers the full style use "Henry the Eighth," not "Henry the VIIIth."

Use the proper decimal point (·) to express decimals as 7·06. For the time of day use a full point thus: 4.30 p.m.

Never put May 19th, 1899, nor 19th May, 1899; but May 19, 1899.

Use the en rule for pp. 322-4; 1898-9, and set as here shown: do not set 322-24; 1898-99.

Paragraphs which are numbered should begin 1., 2., etc.; clauses in a paragraph (1), (2), etc.

These rules are more or less arbitrary, but they have been well thought out, and uniformity of style is much to be desired. Many authors and publishers, as well as the older book-printing and newspaper houses, have their own styles, which must be followed. It will be apparent from the contents of this chapter that a compositor is not a mere mechanic; he is an associate of literature, though a humble one, and he is bound to know the elementary rules which

govern literary composition and the modes of dressing it in print.

We may well conclude this part of our subject with the directions as to spelling, punctuation, and capitalising given by Mr. De Vinne, one of the foremost book printers of the United States :—

1. As a general rule, follow the fairly prepared copy of an educated writer in spelling, punctuation, and use of capitals. If you find some words spelt contrary to prevailing usage, or if pointing and capitalising violate office rules, follow copy without question. It is the author's undoubted right to go before the public in his own way. But, first of all, make sure these peculiarities are his way—that they are of set purpose and not pen-slips.

2. This rule will not apply to serials, in which the methods of spelling, pointing, and capitalising adopted by the editor must, for the sake of uniformity, be observed in preference to the wishes of the author.

3. You must not follow copy that has been carelessly prepared, without system in the use of points and capitals, and by a writer who spells badly, either through carelessness or ignorance.

4. You must correct glaring faults of spelling and of grammar; but you must not transpose clauses, nor disconnect sentences that are too long, nor change words that have not been properly selected. Editing must be done in the manuscript, not at case, nor even in the proof.

5. Reprint copy, when inserted in a text, in the form of extracts from old books, or letters or quotations intended to be literally exact, must be scrupulously followed in every detail of spelling, abbreviation, pointing, or violations of grammar. All the peculiarities of the writer must be preserved, without regard to the method of composition observed in the text.

6. The text must be uniform in spelling, pointing, and

capitalising according to the standard selected, which will, as here specified, sometimes be that of the office, and at others that of editor or author.

7. In standard bookwork, when capitalising according to the rules of the office, use capitals sparingly. On catalogues and general jobwork, capitals should be more freely used as a means of emphasis.

CHAPTER XVII.

HABITS to be acquired and Habits to be avoided by Compositors.

WE will now revert to our task of instruction in the mechanical art of composition, and devote this chapter to the consideration of those habits in type composing which are to be acquired and those which are to be avoided; for you will find that in this art, as in everything else, it is impossible to avoid the formation of habits, and that while those which are good are powerful aids in work, the bad are the worst hindrances a man can meet with; for they are always with him, unless he is strong enough to master them and throw them off. The great thing, however, is to acquire none but good habits; for the renunciation of bad is among the most difficult tasks of life.

Habits to be Acquired.—First and foremost, *maintain a quiet and thoughtful manner.* In the printing office it is due to your neighbours that you should be quiet; it is due to yourself that you should be thoughtful. Composition exercises the mind as well as the body; for while you are picking up the types you must read and spell the words which they form. This cannot be done properly while you are either talking or thinking of something else; hence silence at work is one of the first rules of a well-conducted printing office. “A still tongue makes a full stick.”

Second.—*Adopt a good position.* Something has been said on this point already (Chap. XIV.), but it cannot be too urgently enjoined on the beginner, for the inevitable result of inattention to the direction to stand upright will

be the impairment of his health. Let the compositor consider that perhaps a fourth of his life may be spent in one attitude, and then he may realise how important it is that that attitude should be a proper one. The head should be well raised, the shoulders thrown back, and both feet should be placed firmly on the floor. Any stiffness about the body is very fatiguing to the compositor. The most comfortable position is the easiest, and the easiest is the best. The whole body should be elastic enough to admit of a free motion of any part when necessary, and not from the shoulder joint alone. The compositor should stand facing the *h* and *e* boxes, his right arm reaching over the *a* and *r* boxes.

Third.—*Select mentally every type before you pick it up.* The types in the boxes will be found to be in all possible positions, but before you extend your hand to take one out, look at it, and note how it lies. Seize it the moment your hand reaches the case; then, by the finger and thumb, and in the course of its passage between the box and the stick, turn it so that you may drop it in its proper position into the destined place for it.

Fourth.—*Put each type quietly into the stick, with the simplest motion possible.* The wrist should be brought into play in doing this; the elbow should not be bent at all for the purpose.

Fifth.—*Acquire an even, rhythmic series of motions of the hand to and from the stick.* It is said by one who made his mark as a fast compositor that if the type sought were not seized at the first attempt it was better policy to return the hand at once to the stick and start again than to fumble for a type in the box. This EVEN, REGULAR, AUTOMATIC MOVEMENT is what every compositor should specially strive for. It will be found to pay far better than any other.

Sixth.—*While putting the letter into the stick look out for the next;* the thumb of the left hand, meanwhile, keeping

the letter upright in the composing-stick. Glance at the copy while lifting the spaces.

Seventh.—*Let the left hand, containing the composing-stick, follow the right hand, engaged in picking up the types.* We do not mean that the left hand should traverse the case literally from the *l* box on one side to the *em* quad box on the other, or vertically from the top boxes of the upper case to the lowermost of the lower case, but in a direction backwards and forwards over the latter, so as to save the largest amount of travel for the right hand. If this point be kept in mind, the meaning of our direction will soon be understood, and its great utility recognised.

Habits to be Avoided.—*All movements of the hands or other parts of the body that do not directly facilitate the process of composing should be shunned*, as needlessly wearying to the system, and consequently lessening its productive power. Such are, bending the body, standing on one leg, setting the legs apart, and needlessly inflecting the elbow. Some compositors make a bow to their cases every time they extract a type; others contract a habit of dipping the hand containing the type on its way to the stick. Such habits are as wasteful of time, and unnecessarily fatiguing to the body, as they are ludicrous, and at once indicate defective training, or indolence and affectation.

Do not click the letter on the side of the stick before putting it into its place. This is sometimes done by boys in order to make it appear that they are producing more work than they are really capable of, and they thus get into a bad habit that never, perhaps, leaves them.

Do not make two attempts to pick up the letter out of the case. A determination not to make any false motions will in a day or a week visibly increase the number of types set; you should learn to sight the nick before the hand goes out to pick up the type, so that when it is taken up by the thumb and forefinger there need be no necessity for turning

it round to see where the nick is, the arm meanwhile making a false or lost motion that would have sufficed to bring another type into the stick. An avoidance of false motions is essential to fast type-setting.

Do not look at your copy too long or too often. Endeavour to take away from it in the memory just as much as can be retained until all the types that compose it are set up. The more, of course, the better; but any uncertainty, necessitating another examination of the copy, is a loss of time.

Do not use a guide to indicate the place in the copy at which you are working. Some compositors have a piece of rule or lead balanced by a light cord, to which a type or quotation is attached as a weight, and lay it upon the copy on the upper case to assist them. Such a guide is in reality a drawback rather than an aid. A peculiarity of most fast printers is their quickness of sight. This is diminished rather than cultivated by keeping the eye strained continually on a point directly in front; and the time supposed to be gained in always having the place marked is more than counter-balanced by the time spent in arranging the guide. Besides, the effort to remember the place where he left off compels a man to carry in his head the sense of what he is setting, resulting in well-punctuated, intelligent work. Few, if any, fast printers use guides, while the very slow ones generally resort to them.

We have already (p. 158) enforced the necessity for Order in the composing room. There must be "a place for everything and everything in its place." Nothing must be allowed to be in pie. When types get damaged or broken, they must be relegated to a box in some convenient place.

The composing-stick, too, must be kept clean and bright; for rust and dirt prevent proper justification. Distribution will be afterwards dealt with, but much of the speed of the compositor will depend upon the care with which he or his

predecessor has distributed the matter into the cases. The sorting of the spaces is most important.

Speed is only one of the qualifications of a good compositor. More work is done, and more money earned, by men whose work is correct and careful, with an average degree of speed, than by those who are swift and incorrect.

Employers prefer an intelligent and careful workman to a mere "whip"—that is, an exceptionally quick picker-up of type—for various reasons. He turns out, in the long run, more work, and it is of a better description. The result is an important saving in house accommodation and in readers' labour. On occasions of emergency, work may be confidently entrusted to a careful, "clean," and intelligent compositor, although he may not be so quick, as the time occupied in correcting his proof is inconsiderable, and the job can be got out of hand speedily. Compositors are personally interested in paying attention to these points.

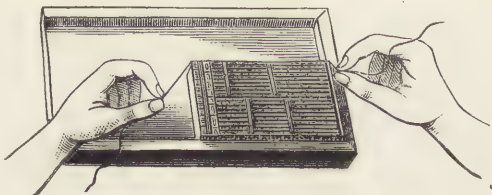
CHAPTER XVIII.

PREPARING THE MATTER FOR PRESS.—Tying-up—Putting on the Chase—the Sidesticks, Footsticks, Furniture, and Quoins—Removing the String—Preliminary Locking-up—Planing—Locking-up—Precautions—Recapitulation.

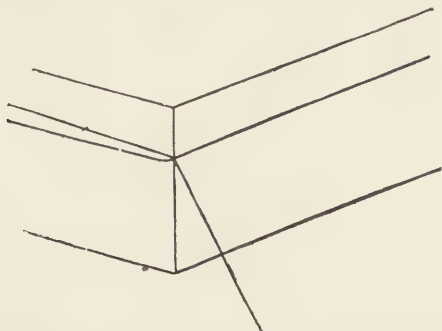
LET us suppose, now, that an order has been received for a hundred or more copies of a page of this book, and that these copies are to be printed on one side of a small sheet of paper. How is the set-up matter to be treated in order that it may be ready to be passed on to the pressman or machinist to be “worked off”? In other words, how is it to become “a forme”? We have shown how each word and line has to be set up in the “stick,” how the stick is emptied on to the galley, and how stickful is added to stickful till a full page of matter stands upon the galley, clumps being added after the last line (see p. 178). The first operation now to be performed is

Tying-up.—This may possibly appear a simple thing, but in reality it is one attended with considerable difficulty, and requires to be done with the utmost care. The many mistakes made by beginners often result in serious accidents.

Procure a bundle of printers’ “page-cord” and partly unroll it. Then hold the end firmly in the *left* hand, as shown in the illustration.

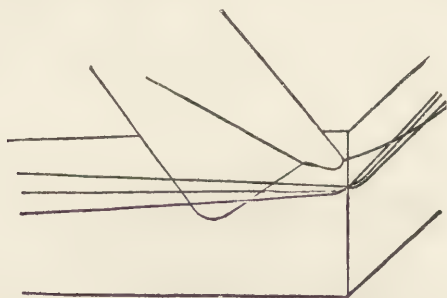


Next, with the *right* hand, bring the cord four or five times round the matter as shown. Let each ply lie closely to the side of the preceding one. When turning the upper right-



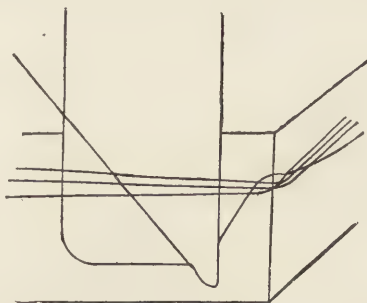
hand corner tighten the cord, and do the same at the lower corner. The folds ought to be perfectly tight throughout, and the first should be as "taut" as the last. This requires some practice and care to do it properly. Having thus been successively drawn round the page several times the cord must be cut, leaving an end of several inches. This is to fasten the whole, and it has to be done without tying a knot.

Now take your setting-rule and, as in the two next figures,



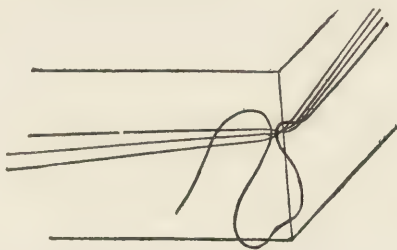
push in the loose end of the cord under the different plies, so that it will be held quite tightly. Remove the setting-

rule, and bring the end of the string into the position shown in the third engraving. Then push the matter, which ought now to be securely fastened up, away from the edges of the galley. One edge of the latter—if a wood galley—is feathered



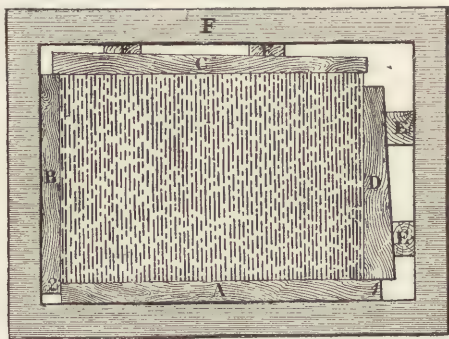
off for the purpose, so that the type may be slipped off on to the stone without giving it a violent shake. This is how to do it:—

Place the galley on the imposing-stone, holding it with the right hand. Apply the left to the top of the letter,



extending the fingers so as to protect the matter at the side, and to prevent the page becoming in the least crooked, and holding the matter perfectly still, with one sharp pull draw the galley from underneath and the page will be left intact on the surface.

The object of the next operation, "locking-up," is that the type may be made secure, and so firmly fastened up that it may be "lifted" from the imposing surface, and laid down or "dropped" upon that part of the press which is designed to receive it. Matter thus locked-up becomes a "forme," or "form,"¹ as shown in the engraving. The



A FORME.

A and B, Furniture; C, Sidestick; D, Footstick; E E, Quoins; F, Chase.

preliminary processes are several, and are to be conducted in the manner following.

Dressing the Chase.—Procure a chase (*F*) somewhat larger than the matter to be locked-up, and place it round the type as a frame. Select a piece of wood furniture (*A*) or sufficient lengths of metal furniture to extend along the side of the matter, and other furniture (*B*) to go along the

¹There has been much controversy over the spelling of this word, purists preferring it to be without the final *e*. It was so spelt by Luckombe (1771), Stower (1808), and Johnson (1824); but Hansard (1825) adopted the spelling "forme." The addition of the final vowel is a simple and harmless method of marking the distinction between a forme of type and the ordinary word form, meaning shape or figure, without endangering the etymological integrity of the two words.

head of the matter. Select the sidestick (*C*) and the footstick (*D*), and place them in the positions shown in the engraving.

The object of this is to fasten the matter in the chase by the insertion afterwards of the quoins (*E*), which, pressing on the chase and sidesticks, tighten the matter by squeezing it.

The side furniture (*A*), as shown, should be a little *longer* than the length of the type matter, and it should extend beyond the last line, as at 1. The head furniture (*B*) must also be a little longer than the lines, and it should project as at 2. The object is to get the whole pressure of the quoins against the sides of the matter, and not to allow any of it to be exerted against two pieces of furniture. If, for instance, *A* underlapped *B* in the lower left hand of the chase, some of the pressure of *C* might be expended on the furniture and not on the type. If either were too short, part of the type would be unprotected.

The side and foot sticks (*C* and *D*) must be placed with the thin parts approaching one another, and the thicker parts sloping in opposite directions. This is most essential, and its necessity requires only a moment's consideration. Sometimes a tyro tries to lock up all round, using two side and two foot sticks. One of these must be worse than useless. Sometimes, too, the sidesticks and footsticks are placed in a wrong position. If they do not slope in the way shown, the forme will be thrown out of the square, and some of the pressure of the quoins will be wasted.

It will be observed that in the illustration the sidestick (*C*) is longer than the matter, and the footstick (*D*) shorter. This plan is not always adopted. Some compositors contend that both should be shorter than the matter, while others assert that both should be longer, the thick end of the sidestick covering the head furniture and the thin end being all but flush with the tail of the matter, and the thin end of the footstick overlapping the thin end of the sidestick.

Whichever plan finds favour, the great things to achieve are, first, that every part of the matter shall be duly compressed by the wedges, and secondly, that there is no binding of the various sticks and furniture, or in other words, that *all* the pressure of the quoins is exerted on the matter.

It is advantageous to have the matter as nearly as possible in the centre of the chase.

Type must never be placed close up to the chase. If there is no room for furniture, a piece of reglet, or even leads, may be used.

If the chase is too large for the matter, additional furniture may be used; but there is danger in having too much of it. If much furniture is required, it is better to use metal than wood. Some prefer to use metal and wood furniture in combination, deeming it more secure than either used alone.

Next choose suitable quoins; practice and judgment alone enable the compositor to select the proper quoins, and frequently he has to do it by trying several before one will be found to fit. Of course the quoins must be inserted so as to taper the reverse way of the side and foot sticks; they must run smaller towards the thick ends of the former, and larger towards the thin ends. If there are no quoins to be had that are broad enough to fill up the space, two may be used together, or one quoin may be used and a little piece of reglet. But this plan should never be adopted if it can be avoided; it is best to avoid having a larger space than can be filled by a single quoin; the minimum should be half an inch, the maximum not much more than an inch. It should be wide enough, though, to admit the shooting-stick easily. Leads should never be used to eke out quoins; to do so is an idle, wasteful practice, not permitted under any circumstances in a well-regulated office.

Remember that the page will be compressed when the mallet and shooting-stick are used; hence larger quoins than at first appear requisite may be necessary.

Having chosen the materials as directed above, put the matter sufficiently far on towards the middle of the imposing table, then place the chase over it, and the furniture and side and foot sticks in their places, and the quoins close by theirs. *Now remove the string from the type.* This must be done carefully, and requires some practice, or the letters will get out of their places at the sides, and the page become, in printers' phrase, "squabbled."

If the matter is tied up as above described, there will be one end of the cord which will protrude two or three inches. It is this end which must be laid hold of, and if it is firmly, yet gently, pulled, the cord will unwind easily. Take hold of it by the thumb and first finger of the left hand, and extricate each fold by the same fingers of the right hand. The whole cord will generally leave the page without disturbing a single type. Next, fasten up the matter a little with the quoins, by pressing upon them with the fingers, but do not make it too tight. Tie up the string in a little bundle, without knotting it, and put it by for use on another occasion.

Next, *push up the quoins with the fingers*, until the forme is somewhat tight. This is a kind of preliminary locking-up. The quoins must not be driven up to the extreme end of the side or foot sticks, but so that they can be pushed forward, when the greater pressure of the mallet is applied, to the extent of a half or quarter inch, according to the size of the forme.

Next, *plane the forme*. This is the process of making perfectly even the face of the forme, by driving down into its proper place every letter that may accidentally stand a little higher than the rest. Although a simple operation, it is not always properly performed.

Hold the planer firmly with the left hand on the face of the forme, and tap it gently with the end of the handle of the mallet, which in doing this should be held with the

head upwards. Pass the planer all over the forme, tapping it as you go. Care should be taken to strike the planer in the middle, so as to distribute its pressure properly.

In this way the forme becomes perfectly level on its face, and it only remains to fully lock it up.

Locking-up the Forme.—Hold the shooting-stick in the left hand in almost a horizontal position, whereby the greatest amount of power is obtained with the least danger of damaging the shooting-stick. Drive up the quoins nearest the *thick ends* of the side and foot sticks first, and then operate on the others, finishing up at the thin ends. In this way the whole will be equally fastened; but if one part is tightly fastened, and another loosely, the pages will bend and become crooked, and a good lock-up—one in which the forme is nearly as solid as though consisting of one piece of metal—will be altogether unattainable.

Again plane down the forme, lightly and carefully. This is done, not so much to drive down any outstanding letters (for they ought all to have been sent into proper places by the planing before quoining-up) as to neutralise any upward bend, or “arching” of the forme, to which it is especially liable if there are open blank spaces in it. The next thing to be done is to “*see if it will lift* ;” that is, if it can be raised up from the imposing surface without any letters falling out. When a forme is properly locked up, it is equally tight throughout in every part; and if the composition has been accurately done, no letter, space, or quadrat will drop out when the forme is raised. The forme is then said to “lift;” if it be loose in any part, so that there is danger of anything falling out, it is said that it “won’t lift.”

Draw the forme over to the side of the stone nearest to you, and let the chase overhang about an inch. By taking hold of the projecting part, the forme may be partly raised. The side should only be lifted a little, say an inch at first, before you are sure that all is tightly secured. If letters

fall out, that is, if the forme is loose in any part, the fault is due either to bad "justification" in the composition or imperfect "locking-up." The remedy in either case will be obvious ; the forme must be unlocked, lines or pages adjusted, or fresh furniture and side or foot sticks, or quoins, inserted.

Even if the letters do not fall out there may be loose parts, and these may be discovered by lifting up the forme from the stone about half an inch at one end, and slightly pressing the fingers over it in every part. Loose places must be secured by tighter locking-up.

Recapitulation.—It may be well to recapitulate in order the processes which have been described. They are :—

1. Setting up the matter letter by letter until a line is formed, and a number of lines sufficient to fill the stick.
2. Emptying the stickful on the galley, and successive stickfuls until the whole page is composed and laid on the galley.
3. Tying up the matter.
4. Sliding it on to the imposing-stone.
5. Putting on the chase.
6. Dressing with furniture.
7. Inserting the side and foot sticks.
8. Unloosing and removing the page cords.
9. Fitting the quoins.
10. Preliminary locking-up.
11. Planing the forme.
12. Locking-up.
13. Second planing.
14. Ascertaining if the forme "lifts."

An impression, called a "proof," is next to be taken of the forme, to ascertain how the composition has been executed, whether it is correct according to the "copy," and whether

there are any defects of workmanship to be rectified before the forme can be worked off. For this purpose the forme is taken to a press, and laid on the bed of it, the type is inked, a sheet of paper laid over it (or on the tympan of the press), and the impression taken, as stated on page 17 and more fully explained in a subsequent chapter.

CHAPTER XIX.

CORRECTING.—Readers' Duties—Readers' Marks—A Corrected Proof
—Dropping the Forme—Unlocking—Preparing the Corrections
—Space Tray—Use of the Bodkin—Method of Correcting—Over-
running.

WE will suppose that the forme has been sent to the pressman or proof-puller, a proof pulled,¹ and submitted to the "reader" or corrector, who has marked on it the errors he finds. This proof and the forme are returned to the compositor, in order that the "marks" on the proof may be attended to by making the necessary "corrections" in the forme.

Though part of a chapter will later on be devoted to the duties of the printer's reader, it is necessary that the young compositor should have at least a general notion of what those duties are, and a thorough knowledge of the meanings of the marks the reader makes on the proofs submitted to him.

Speaking generally, then, it is the duty of the reader to see that every word is properly spelled, and duly set in the type proper for it; that the spacing is correct; that paragraphs begin and end where the author intended; and, in short, that the work appears in print just as it ought. Now, even careful compositors scarcely ever set up matter without making some mistakes, while careless ones make a great many, so the reader's functions are most necessary. He

¹Proofs are said to be "pulled," not printed, the more dignified term being reserved for the perfect impressions.

goes through the proof with the "copy," and when he comes across a mistake of any kind he marks it at the proper spot in the body of the printed matter, and in one or other of the margins opposite to the line where the error is, he writes the sign indicating what ought to be in place of what is. Some of these signs are plain enough and require no explanation; others are quite arbitrary, and though universal in printing offices, and well understood by the initiated, require to be learnt before they can be comprehended. We will now give a list of the usual marks.

The following marks are made in the *text*, and have these meanings:—

- / (through a letter)—"Make the alteration shown in the margin."
- (under a letter)—"Make the change indicated in the margin."
- ^ (between letters)—"Something is omitted—insert what is indicated in the margin."
- ⊂ (between letters)—"These letters are too far apart."
- L (between words)—"The spacing wants amending."
- [(between words)—"Begin a new paragraph."
- [or] (on either side of a word or words)—"Put this word or these words in the centre of the line."
- ⊃ (after a word or syllable at the beginning or end of a line)—"This looks bad; take it into the preceding or following line."
- (between two paragraphs)—"Run on—do not begin a new paragraph."
- ⋈ (round the beginning of the first word of a line)—"Commence the word where the perpendicular lines are."
- └ (at the beginning of a line)—"There should be no indentation."
- ┐ (between letters or words)—"Transpose."
- == (across lines)—"These lines are crooked,"

..... (under words or letters struck through with the pen)—“Leave them as they were.”



Lines like as in brickwork, enclosing words at the ends of two or more consecutive lines, mean—“Take these words over to the commencement of the following lines.”

Similar lines at the beginnings of two or more consecutive lines mean—“Take these words back to the end of the preceding lines.”



(between lines near the bottom of a page)—
“Take these lines over to the page following.”



(between lines near the top of a page)—
“Take these lines back to the preceding page.”

The following marks are made in the *margins*, and have these meanings:—

δ “Delete (or take out) the letter or word indicated.”

9 “The letter indicated is upside down.”

w.f. “The letter indicated is of a wrong fount.”

× “The letter indicated is battered or otherwise requires to be changed.”

trs. “Transpose the letters or words indicated.”

□ “Indent by inserting an em quad.”



“Indent by inserting three em quads (the number being indicated by the number of squares).”



“A space is standing up.”



“Equalise the spacing.”



“Insert a space.”



“Bring close together.”



(under fl or ffi, etc.) “Substitute a ligature for these separate letters.”

≡ "Straighten these lines," or "types dropping away."

A letter or other character (e.g., *a*)—"Insert this letter or character in the text at the place indicated."

⊙ "Full point."

/-/ "Hyphen."

/—/ "Em rule."

7 This sign is placed under apostrophes, inverted commas, asterisks, small letters, and figures to show that they are "superiors."

/ This sign (called the "separatrix") is written after a mark to separate it from a second which may have to be made in the same line.

caps. "Set in capitals."¹

sm. caps. or *s. c.* "Set in small capitals."²

l. c. "Set in lower-case letters."

rom. "Set (the word) in roman type."

ital. "Set in italic."³

back. "Take these lines back to the preceding page," or "look at the back of this proof."

centre. "Put these words in the centre of the line."

new par. or *N. P.* "Begin a new paragraph here."

out. "Something is omitted."

out see copy. "Refer to copy to see what is omitted."

over. "Take these lines over to the next page."

Qy. (Query). "Find out if this is right."

¹ Sometimes the word or letter is written in the margin with *three* lines under it. These, as we have seen, mean "set in capitals." Sometimes the letter is written with a capital without other indication.

² Sometimes the word or letter is written in the margin with *two* lines under it; these lines mean "set in small caps."

³ Here again sometimes the word is written with *one* line under it.

Qy. con. "See to the connection between this and what goes before."

run on. "Do not let the following sentence begin a new paragraph."

stet. "Let it stand as set."

On the page following we give a facsimile of a proof with reader's marks on it, and on the page opposite to it the matter as it appears after the corrections have been made. The young compositor must study these and the synopsis given above, so that immediately he sees a reader's mark he will know exactly what it means.¹

While the proof is being read the forme may be kept in a forme rack. The proof having been returned to the composing room, the forme must be taken from its rack and laid on the imposing surface, to enable the corrections to be made.

Preliminary to Correcting.—*Dropping the Forme.*—Take the forme to the imposing surface and "drop it;" that is to say, lay it gently in its place in such a position that the head of the forme is nearest you. The proper way to drop a forme is to place its lower edge on the surface, and then gradually to bring the rest of it down, permitting the edge held in the hand to project a little over the edge of the imposing surface, in order that it may be brought down without having to withdraw the fingers, and without letting the whole come down with a thud. Carelessness in dropping a forme frequently injures it or the imposing surface. Letting it down too slowly allows loose letters to drop out. Should any do so, and fall underneath the forme, the latter must be raised again and the letters removed, or much trouble will ensue.

¹ All the marks on the proof may be interpreted by reference to the synopsis above; the word "Jones" means that the matter was set by a compositor bearing that name.

dy Con. centre

AN EDITOR'S HOLIDAY.

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Jones
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3/6 +

run on

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 $\times R$

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 $\sigma T /$

!

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92.

с

Passing on we see the ruins of the Temple of Peace, and such ruins! Several noble arches form three aisles, of 300 feet by 200 feet, and the arches show decorated masonry which may make us well believe that there were excellent masons, bond or free, in those days. We now come at once upon the most perfect, the most public, and the most interesting of ancient sights, the Arch of Titus. The Rector of Warrington photographed it ten years since, and kindly gave me a copy, which has familiarised it to my mind. There it stands about fresh as 1,800 years ago.

One of the Popes has mended it a little. It is a memorial of the destruction of Jerusalem. On the front is an inscription to that effect; and on the inside of the arch ~~inside of the arch~~ are engravings of the sacred vessels carried away by the Romans. It would not be there if St. John visited Rome in his old age he would see the melancholy sight; No doubt Josephus often passed under this arch, as he lived at Rome until the days of Domitian. Through it passed the Via Sacra on to near the Colosseum, where it rounded the Palatine, and was called the Triumphant Way.

the Colosseum. We are in it at after last years of hopes, fears, and longings. And this is the building finished ten years after Jerusalem was destroyed, and at which so many Jewish slaves toiled. Its proportions are too perfect to look large. It forms an ellipse, built four storeys high, three of the stories resting on 240 arches. Half-columns of the Doric order support the first range, Ionic the second, and Corinthian the third, and the fourth story, of which one half remains, had a solid external face of Corinthian the pilasters. The centre of the arena had full underground accommodation for wild beasts, gladiators, and their belongings. On arches rising on arches are tiers of seats for 87,000 spectators. The uppermost have an awning over them, supported by poles in rings outside, yet visible; but of course the Colosseum is an unroofed building, covering nearly six acres, or double that of Carnarvon Castle, and

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Next, *unlock the forme*; not roughly or suddenly, but slowly and carefully. Drive each of the quoins just a little out of its place, to loosen it, before you take it out altogether. Begin with the quoins that are nearest the thin ends of the side and foot sticks, and then go to quoins nearest the thickest parts of the furniture. Remove a quoin from each side of the forme alternately; you will thus gradually get them away from the matter without distorting it, or causing any of the type to become squabbled. Generally speaking, it is desirable to loosen the quoins at the side first, as leads are apt to be bent when quoins at the foot are loosened first.

Take the proof to the case, and set up in proper order in a composing-stick all the types that will be required to make the corrections. Take out a few of each kind of spaces from the case and lay them on a piece of paper, without mixing them.

When corrections are numerous, as in large formes, a *space tray* is useful.

thin	middle	en	em
thick		quads	

SPACE TRAY.

It should be about 6 in. by 4 in., and $\frac{3}{4}$ in. deep. It can be supplied with a few of the spaces of the particular fount in use each time there is correcting to be done. This finished, however, all spaces must be returned to their proper places in the case.

Use of the Bodkin.—With the corrections set up in the stick, and a few spaces at hand, the compositor is ready to

begin correcting. He will want a sharp bodkin¹ to raise the letters required to be taken out. Compositors are expected to provide their own bodkins; indeed, a stick, a bodkin, and a setting-rule constitute often the compositor's sole personal business effects. Bodkins are sold by printers' brokers, at two shillings per dozen; it is therefore not creditable to a man if he has not a proper one always at hand.

Take the bodkin in the right hand and place the point of it against the *shank* of the letter that stands at the end of the line which contains the correction. Be careful to avoid touching the face or serifs of the type with the bodkin, otherwise the type will be irremediably injured. Place the middle or second finger of the left hand at the beginning of the line. The line may now be raised above the level of the rest of the type, and the compositor will have not only a clear view of every letter in it, but ready access to any that may require alteration. The proximity of the other lines keeps it from dropping down again when once raised.

Take out with the thumb and first finger of the left hand the letters that have to be removed, and insert the fresh letters with the same fingers of the right hand. When the line is thus corrected, push it down to the level of the other lines, and pat it on the top with the fingers, in order to get all quite level, taking care to push all the spaces down.

If the correction is very large, or involves an alteration in spacing, the proper plan is to lift out the line, put it in a composing-stick, correct it, rejustify it, and replace it in the forme. Sometimes, as will be seen below, it is necessary to remove also the line or lines next following.

¹ Correcting nippers are often preferable, especially in table work. They extract types more readily and with much less danger of damaging them than a bodkin.

On the other hand, if the corrections be few, the types required to be inserted may be held between the first and second fingers of the left hand, correcting—both the lifting out and putting in—being done by the right hand.

It is most important that when letters really do require to be drawn out with the bodkin (which is less often than inexpert compositors seem to think) the point of the bodkin should not be applied to the face or kern, but only to the shank. The bodkin must be held as upright as possible, in order to avoid injuring the types that are contiguous.

When all the corrections are made, the whole of the types set in the composing-stick for alterations will be used up. If they are not, either too many have been set up or



all the corrections have not been made. The plan of setting up the corrections beforehand generally acts as a test of whether the marks have all been attended to, and obviates the necessity of going over them to check them.

It is a saving of time to correct all the wrong letters before adding the inserted matter, or removing those parts which have to be abstracted; and it is always well to begin at the top and go through the matter in order—in other words, not to dodge about in correcting. The readjustment of the spacing should be made as you go along.

Some compositors save much time by correcting in the following manner: While the hands are employed in finishing the first correction, they look out for the place where the second is to be made, and when that is done they

look out for the next, and so on until all are finished. Indeed, the fingers should never be kept idle in correcting.

If there are more letters to be inserted than to be taken out, the spacing must be diminished ; but on no account should the symmetry of the matter be injured by too small spaces being used.

Overrunning.—If the line is too long after all allowable space is taken out from between the words, there is nothing for it but to “overrun” the matter ; that is, to take some of it into the succeeding line, and some of that into the next one, gradually diminishing the matter taken over until all has been got in, without injuring the appearance of the work. A very simple insertion may cause a whole page to be overrun, if the type is large. Similarly, if words are deleted, overrunning may be necessary, only here the object will be to “drive out” instead of to “get in.”¹

The best way to overrun is to lift the line bodily out of the forme, and place it on the side of a galley. Then make the insertion, and notice how much the line is too long or too short. Endeavour to make an estimate of how many lines will require to be overrun, and place them, if possible, along with the first, making one long line. Then take as much matter on the setting-rule as is required to fill the measure, and place it in the stick. Justify it in the stick, then take up enough matter for another line, justify that, and so on. When all the matter requiring overrunning has been justified, it can be lifted from the stick into the forme, and will be similar in appearance and measure to the rest of the page.

It is a good plan in overrunning to lift the lines which have to be altered and place them nicks downward on the

¹To “drive out” matter, *i.e.*, to make it occupy more space, additional (or larger) spaces are placed between the words ; to “get in,” *i.e.*, to make the matter occupy less space, some spaces are taken out or smaller ones are substituted for those originally used.

galley; this brings the first line to be operated on uppermost, and it and the succeeding lines can be lifted into the stick rapidly.

When all corrections and overrunning have been done the forme is again locked up, and is then ready to be "sent to press."

Whenever practicable, the galleys used for the reception of matter composed in the stick are the slip galleys shown on page 105. From the matter in these galleys "slip proofs" are pulled before it is made up into pages, and it is these proofs which are first "read" and corrected. The correction of the matter is more easily made when the type is in galley, and it is only final or author's corrections which are made after the matter has been imposed. Indeed, if the author will allow it, the best plan is to submit "clean" slip proofs¹ to him in the first instance. It is a great saving of expense.

¹ "Clean proofs" are proofs free from typographical, or compositors' mistakes.

CHAPTER XX.

DISTRIBUTING.—Object of the Process—Dropping the Forme—Unlocking—Removing the Chase and its Dressing—Directions for Distributing—Various Hints.

THE forme having been worked off, at press or machine, the type requires to be distributed.¹

The process of *Distributing* may be said to be the converse of that of *Composing*. The latter consists of the lifting of letters out of their boxes and composing them in such order as to constitute words, sentences, and paragraphs. The former may be termed *de-composing* such composed matter, and returning the several letters to their proper boxes in the case.

The two principal points to be aimed at in learning to distribute are, to do the work with the utmost "cleanliness," that is, correctness; and with the utmost rapidity.

It is obvious that unless distributing is correctly performed, a case will soon get into a state of pie, and that when used again for composition many errors will ensue. As compositors usually distribute their type before they begin to set it up, it is equally clear that it is to the workman's own interest that he should return the types to their proper places, in order to avoid having to correct or change them, as already described. Hence the desirability and the necessity of exercising great care in this department of the compositor's business, one which we are sorry to say is too often done carelessly, and as though it were a sort of

¹ If put by for future use it is said to be "kept standing."

"necessary evil." Again, although a considerable proportion of every man's time must be devoted to distributing, yet that amount of time should be minimised as far as it can be, in order that as much as possible may be devoted to composition; for compositors on piece¹ are paid, not for the amount of matter they distribute, but for the amount of matter they set up, and it is the quantity of composition done and not the distributing that brings in a return to the employer.

As compared with composition, distributing is done with remarkable rapidity. A good workman will distribute from 4,000 to 6,000 letters per hour; but the quantity depends to some extent upon the size of the type and the condition and character of the matter.

Before beginning to distribute, the compositor should be careful that the forme is thoroughly "washed over,"² and any remains of the ink with which the printing has been done are completely cleared off. The surface of the type, the furniture, the quoins, and the chase should be perfectly free from ink, and incapable of soiling the fingers.

The first thing to be done is to "*drop the forme*" on the imposing surface; the next, to unlock it. In performing these operations pay strict attention to the instructions already given on the subject (pp. 219 and 222).

Then *remove the chase*, first wetting the matter slightly, especially at the edges, to guard against the types falling down when the furniture and sidesticks are removed subsequently. Get a basin of clean water and take up a little

¹ Compositors "on piece"—or "piece hands"—are those who are paid according to the amount of matter they set, and not according to the time they are at work. Workmen who are paid a regular weekly wage are said to be "on the establishment" or "on the 'stab'."

² Directions for washing over formes, and recipes for detergents, will be given subsequently.

with the closed fingers. Then sprinkle the type with as few and small drops as may be ; do not "deluge" the matter. A sponge may be used for this purpose ; but not a lump of paper, which is apt to get dissolved and, in a condition of papier-maché, is likely to fill up the face of the type. If there is any part of the matter that is required "to stand," that is, to be used again, take it away, tie it up, and put it by on a letter board or in some other safe place.¹ Put the furniture, the quoins, chase, etc., in their proper places, then you will have the matter ready for operating upon. In most cases it is convenient to remove the type to a galley, and to keep it in some convenient place near the case.

Before actually beginning to distribute the types, the workman should examine whether his cases are clean and free from pie. If there is an accumulation of dust in the boxes, it should be blown out with a pair of bellows, the nozzle of which should be held close down to the boxes. If there is pie, it should be cleared away before fresh type is thrown on the top of it. The space and quad boxes should be looked to ; they often harbour pie, broken leads, bits of rules, etc. When all this has been done, holding the case by its sides, give it a gentle shaking, to level the heaps of type in the different boxes. Do not, however, use unnecessary violence.

Distributing.—In order to show him the *principle* of distributing, we will ask the young compositor to take up between his forefinger and thumb a word, in types, and then to let each letter fall into its proper box, aiding this by slightly propelling them forward, keeping at the same time the remainder of the letters in proper position. The types must not be held tightly ; only tightly enough, in fact, to

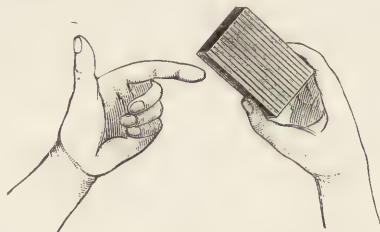
¹ Matter thus put by, or kept in chase, is called "standing matter."

retain them between the fingers. Move the hand well over the case; that is, do not throw the type any considerable distance. Rather let the hand be above the box, and let the type fall into it naturally. But the hand should not be too high above the case—two or three inches is quite sufficient. As the letters are distributed, and the number gets less and less, move what remain to the extremity of the fingers by pushing them slightly forward with the thumb. As you proceed, you will acquire with practice more confidence, and hold the types less tightly. You will soon find out with how little pressure the letters, especially if damp, hold together. If nervously clutched, the types cannot possibly be quickly distributed; and one of the essentials of rapid distribution is to retain them in the grasp of the thumb and forefinger as lightly as is necessary.

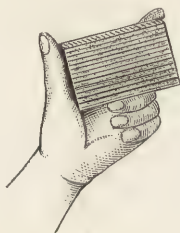
Care should be taken to distribute only one letter or type at a time. Even if there are two letters of the same kind together, there is no time saved in departing from the rule of distributing one type at once, and doing that as quickly as possible. If perchance two different letters get thrown into one box, the wrong one must be immediately looked for and put into its proper place, before another type is distributed. This rule admits of no exception. The beginner should take up a few letters, as many only as he can conveniently hold between his thumb and forefinger, and try to distribute them as fast as he can, consistently with correctness. If possible, always take up a complete word and the point or space which may follow it.

You may next take up a few lines of matter, and try to distribute them. Put a rule or thick lead at the back of the portion of matter, which should be the last on the galley, and take the whole up by pressing at the beginning and end of the lines with the first finger of the left and right hands respectively; the thumbs supporting the matter. Then hold the matter with the right hand only, inclining it

towards the hand in order that no part of it may fall off the rule. Meanwhile, partially open the left hand, with the palm



nearest the eye, the first finger extending in a horizontal direction, and the thumb pointing upwards. Place the rule or lead and the type it contains on the second finger, but incline the matter so that the thumb affords a support for the beginning of the line. Indeed, the line should be at an angle ; the end of it higher than the beginning. The types will now be quite secure on the left hand. All their nicks will be uppermost ; their faces will be next to you. This is the essential situation for the letter ; no other is possible.

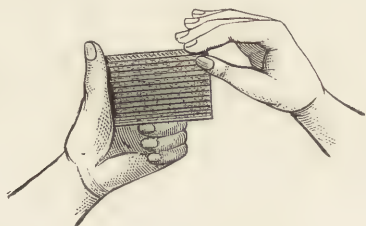


The right hand is free ; it is to be used for taking away in portions the matter to be distributed. Remove only a small portion at a time ; a word and its space, for instance. When that is distributed, take another word, and so on till the whole line is exhausted. Beware, as you get to the middle of the line, lest the type lose its balance ; above all

keep the whole steady, and avoid any movement which might cause it to be spilled into the case.

Be cautious not to take up too much type at first. If you do, you are nearly sure to spill it into the case, and incur the trouble of picking out the wrong letters from the different boxes.

Finish each line before touching another. Do not take a piece of the top line, and then a smaller piece of the line underneath; a letter of that underneath it again, and so on. This way of working is sure to cause pie. Clear away everything as you go on, every space, point, etc., before the word that comes next is taken up.



One or two words is quite sufficient to be taken between the fingers at once. The lines being upside down, they are read from left to right, like ordinary printed matter, but as you have to begin at the end of a line, you have no connection between the words. If, for example, the line were, "He took up the pen," and you were composing, you might easily remember it; but in distributing you would take up *the pen* first, then *took up*, and then *He*. One glance at the type should be sufficient, and this should be taken while the fingers are removing the portion from that which is in the left hand. If you get into the habit of looking repeatedly at the matter between the thumb and finger, you will lose much time, and involve yourself in much unnecessary trouble.

The portion held in the left hand whilst distributing is called a "handful," although it may only consist of a few lines.

The second finger of the right hand should only be used for separating the types, in order that they may, when over the boxes to which they belong, fall into those boxes. The thumb and the first finger are used rather to hold than to separate or disjoin the type.

Take a moderate handful at a time. Too large a one is dangerous and inconvenient; it needlessly tries the wrist. Too small a handful involves waste of time in needlessly frequent lifting.

Never throw letters into the case with their faces downwards. Doing so batters the fine lines, and sometimes breaks off the serifs. A careless compositor may in this way wear out the types, by the mere process of distributing, faster than if they were kept constantly printing under a cylinder.

Do not overfill the boxes or the case will get into pie. Occasionally you will find a small heap of types accumulating in the middle of the boxes; level these by moving a little of the type into the corners, or shaking the case. If cases are put away with great heaps in the middle of the boxes, or with the boxes too full, they are generally pied by letters getting into adjoining boxes. The types also incur great danger of being broken, as it is so often necessary to place cases on the top of one another. For this reason the boxes should never be filled to a point higher than the tops of the bars.

If there is an excess of some particular sorts of type in the matter distributed, some of the boxes may get overfull, while others are nearly empty. To avoid this remove the super-abundance from time to time into another case, or into a fount-case, or even tie it up in a parcel, marking on the outside what it contains. Try to keep the case as even as possible; that is, to keep a fair proportion of type in each box.

Take care also to *keep the different kinds of spaces in their proper boxes*. Some little consideration is necessary to do this at first, especially in regard to founts of small types, the difference between the middle and thin space of which, for instance, is so minute. Practice, however, will overcome this difficulty, and enable the compositor to know the character of a space at a glance.¹

We do not know of any part of the business of a compositor in which he is so awkward at first as distributing; nor is there anything about it which strikes a stranger so much as the dexterity that is acquired after practice. A competent, experienced compositor literally showers the types into their respective boxes. As he moves his hand over the boxes, it would appear as though he were dropping in the types at random; yet every movement is a designed one, and every type finds its proper place in the cases.

The ability to distribute correctly and expeditiously is an acquirement of great importance. Accuracy will reward a conscientious purpose to do the work well; speed will be acquired by careful practice, and a persistent endeavour to do it in the best way.

Various Hints.—Apprentices are sometimes put to distributing before they have learned to compose; sometimes even before they know the difference between such letters as p and q, the small cap w and the lower case w. The result is that the cases are got into a state of pie.

The letter board and galley should always be clean before the matter is placed on them for distribution.

¹Some printers keep each space distinct in a separate box (see diagram on p. 151); others mix the thick and middle, and keep the thin and the hair spaces separate; thus three boxes are required for spaces. The more usual plan is to mix the middle and thin spaces; for in composing poetry, or any matter not consisting of full lines, it is disadvantageous to have thick spaces mixed with any other. Whatever may be the established rule in any office, the compositor is bound to follow it.

New type, when wetted, is apt to become "baked," i.e., to stick together tenaciously. This may be prevented by soft-soaping the type well before it is laid,¹ or cured by soaking or damping it with a very weak solution of glycerine in water. New type is often irretrievably damaged, after being only once used, by being struck against the stone to loosen it.

By rubbing the fingers with alum the compositor may so harden the skin that the type does not cut it, which it is apt to do when it is wet, new, or baked.

If letters fall on the floor (as they are very liable to do) during the process of distribution, they must be carefully picked up and returned to the cases. The quantity of type left on the floor and swept up, and consequently seriously injured, is, in many indifferently managed offices, most deplorable.

¹Type is said to be "laid" when it is removed from the type-founders' parcels, and placed in its proper boxes in a case.

PART III.

THE VARIOUS BRANCHES OF THE COMPOSITOR'S ART.

CHAPTER XXI.

INTRODUCTION TO BOOKWORK.—Definition of a Book—Its Constituent Parts—Sheets—Names of Sizes of Books—Pagination.

IN the preceding chapters we have dealt with the operations common to almost all kinds of compositor's work, from picking up the types to returning them to the cases after being worked off as a forme. The elementary principles of the art of typography are contained in these directions, and the compositor may now be given specific instructions in the peculiarities of the different branches into which his craft has divided itself.

These are, substantially, Bookwork, Newswork, and Jobwork.

It must not, however, be supposed that there are any sharp dividing lines between these three branches. On the contrary, much of the work that will here be described under the heading of Bookwork, because it is most appropriate to that branch, has also to be done in newspaper offices, and also to a limited extent in jobbing offices. Nor must it be supposed that there is any natural order in the arrangement of the three branches, or that the compositor graduates from bookwork to newswork, and thence to jobbing. Nearly all depends on the character of the office in which the apprentice finds himself, or the peculiar

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circumstances under which he is "bound" to the trade. If he is brought up in an office where the three classes of work are done, he may reasonably expect to be offered some opportunities of practice at each; but this seldom happens, hence the use of practical directions such as the present are intended to be, which should enable him to supplement the knowledge he acquires of any one or more branches by information concerning the others.

We now address ourselves to *Bookwork*, and as a preliminary ask the reader to consider what a book is, and how it differs from such a piece of composition as the page already treated of, printed on one side of a leaf of paper.

A *book* may be said to be a collection of sheets of paper folded and forming leaves, the sides of which leaves are called pages. It may consist of any number of pages, from four upwards. Books of few pages not cased in boards are often called pamphlets.

As will be seen later, each of the sheets of which a book consists usually bears a letter of the alphabet or a number, in due sequence, whereby it may be known; this letter or number is called the *signature* of the sheet.

As has been stated in Chapter III., sheets differ in size, and each size has its appropriate name; it may also be folded in the various ways described in that chapter, and the folding determines the number of pages in the sheet.

The size of the leaves of paper of which a book is composed determines the name of the size of the book: thus we have books in folio and in quarto; in demy octavo, crown octavo, demy 12mo, 24mo, and so forth. Among booksellers, where no name, such as crown, is mentioned, it is generally understood that the paper used is demy, *e.g.*, "8vo" means demy 8vo.

Pagination.—The pages of nearly all books are numbered consecutively. The page number is called the "folio." The numerical sequence of the pages is called the "pagination."

Pages with odd numbers, as 1, 3, 5, are called "odd pages," and are always to the right on the book being opened; the "even pages" (those with even numbers), as 2, 4, 6, are always to the left. This should be borne in mind.

From what has been written, it is manifest that the matter of which a book is to be composed when set up in type must be divided up into pages, and that these must be so arranged that when printed they will present a proper appearance and succeed one another in due order. The following chapters will show how this is done.

CHAPTER XXII.

MAKING UP.—Dividing the Matter into Pages—Tying up—Transferring to Imposing Surface.

THE arrangement of composed matter so that it may be divided into pages is called *Making up*, and the arrangement of pages so that these pages will read consecutively when printed is termed *Imposing* the pages or *Imposition*.

Making up consists of:—

1. Measuring the matter into pages.
2. Tying up the pages.
3. Transferring them to the imposing surface.

Imposing consists of:—

1. Arranging them in proper order and position on the imposing surface.
2. Getting them into chase in such positions.

Making up.—Remarks on the relation of the sizes of pages of type to the dimensions of the leaves on which they are to be printed will be found subsequently under the head of Margins. For the present we suppose that the compositor has instructions as to the length of the pages; the width, of course, has already been determined by the measure to which the matter has been set.

We will assume that the matter for the sheet now lies on the galleys. The first thing to be done is to set the head-lines,¹ if the book is to have such lines. Instructions as to them—whether they are to be in small capitals or italic, etc.

¹ A head-line is the line at the top of a page indicating either the work or the subject-matter of the page below: it is in the same line as the folio.

—will be given to the compositor by the overseer.¹ They will be odd head-lines or even, according to the page on which they are to appear. Very frequently the title of a book is repeated as the even head-line, and for the odd head-line is placed the subject of the matter underneath.² The former would be called the running head-line. The folio or number of the page *begins* the even head-line, and *ends* the odd.³

After the head-line usually comes a “white” or blank line, generally formed of quadrats of the same body as the type of the page. Sufficient of these lines must next be set up. A two or three em extra white is allowed between the head-line and the chapter line when a new chapter commences the page, that is, the chapter begins lower down than an ordinary line of type would.⁴

The compositor will be told the number of lines of print of which the page is to consist. He must measure that number, and then mark the length on a piece of reglet, which will form the gauge for all the pages. Two kinds of gauges are here illustrated.

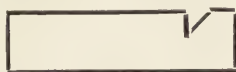


FIG. 1.

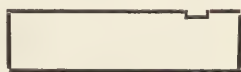


FIG. 2.

¹ See also, *Bookwork Miscellanies*, *post*.

² This is usually left blank in first proofs in order that it may be supplied by the author.

³ There may, however, be no head-line; in such a case the folios are sometimes centred, *i.e.*, placed in the middle of the top line. Or it sometimes happens that the corners of the head-lines are occupied by subordinate headings, and the folio crowded out. They can then be inserted at the foot of the pages.

⁴ When each chapter in a book commences a page the running head-line is omitted, and the folio either centred or omitted on that page. If the work is to be stereotyped or electrotyped, and the folio is to be omitted from the head of the page, it will be found a great advantage in dealing with the plates to have the folio centred in the white line at the foot of the page in small type.

In Fig. 1 the bottom of the white line comes level with the upright part of the notch. In Fig. 2 the white line comes exactly inside the piece cut out ; this is the best form where the most careful make up is necessary.

In the case of a serial work or magazine, a gauge made out of rule is the best, it being more durable than wood.

At the bottom of each page, after the reading matter, follows another "white line," also formed of quadrats. The signature will go in this line in the pages requiring it.

Now place a head-line against the top of an empty galley, and after it the white line ; then lift on as much matter as will form the page. This must be done in portions—about a stickful at a time. If the matter is solid, *i.e.*, without leads, it would be best to slightly wet it with a sponge. Insert the setting-rule at the place where the first portion will end, push the whole a little way along the galley to separate it from the rest of the matter, and then lift firmly and steadily to the making-up galley ; continue until a complete page has been thus transferred.

In making-up, the first line of a paragraph is permissible as the last line of a page. The last line of a paragraph, however, should never fall at the top of a page ; one full line and the line containing the completion of the paragraph being the smallest quantity allowable for passable effect. To obtain this it is oftentimes necessary to "take back" words to save a line, or to "take over" words to make an extra line.

Press the matter tightly up to the head of the making-up galley. Get your gauge and see that you have just the right quantity for a page.

Next, tie up the page in the manner described on pp. 205-7.

Then push it from the making-up galley on to the stone. The galley is now clear for making-up another page. Proceed until all the matter required is made up into pages and placed on the stone.

The above is the old-fashioned method of making-up. A more economical way is to make up your pages on slip galleys, adding the head and white lines there. You can thus often have several pages on a galley, each, of course, divided from the other by clumps or furniture, and you are thus able to send out slip-proofs of the matter in pages, and corrections can be much more easily made than otherwise. The pages when corrected are tied up on the galleys, and are pushed off them on to the imposing surface one by one.

In making up a work containing tables or tabular matter, or whenever the matter cannot be easily made up into pages, it is best to measure off on the slip proofs, or measure the pages on the galleys, marking the place where the divisions of the pages fall, so that any difficulty may be met before the chapter is made up.

If it is a newspaper that is being made up, you take one of the column rules¹ for use as a measure, and when you have enough matter for a column you damp it in the galley, unlock it, and then slide it on to the "stone" without tying up.

Random.—The special frame or stand used by compositors for making up, and on which are kept standing head-lines and other matter wanted for that purpose, is called "the Random."

¹ See page 12.

CHAPTER XXIII.

IMPOSING.—For Folio, Quarto, Octavo, and Sexto Decimo Work—
Half-sheet Work for the same.

Imposing.—The next operation is so to place the pages in position that when printed they will read in the order of their folios. This is one of the most important operations in the work of the compositor. We will endeavour to show the *principles* on which the art depends, and which, when once understood, render it possible to lay down correctly any forme, whatever its number of pages.

Folio.—If a four-page tract, or ordinary four-page newspaper be opened, it will be seen that the second page falls at the back of the first, and the third at the front of the fourth. If you lay it down on a table with the first page uppermost, it will be found thus:—

..... 4 .....	..... 1
.....
.....
... Print ...	... Print ...
.....
.....
.....

and the other pages are, of course, when they are turned uppermost:—

..... 2 .....	..... 3
.....
.....
... Print ...	... Print ...
.....
.....
.....

The forme containing the first page is always called by printers the *outside* or *outer* forme, and that containing the second page the *inside* or *inner* forme.

The impression from any arrangement of pages of type will, it is obvious, be the reverse of the order in which they are placed on the imposing stone. Hence, if we want to print pages which will read like the above, we must reverse their order. Accordingly we place them thus:—

IMPOSITION FOR A SHEET OF FOLIO.

..... 1 .....	..... 4
.....
.....
... Type ...	... Type ...
.....
.....
.....

Outer Forme.

..... 3 .....	..... 2
.....
.....
... Type ...	... Type ...
.....
.....
.....

Inner Forme.

This example contains the leading principle of the art of Imposition, and should be thoroughly understood. *Why* is the fourth page imposed with the first? Because on unfolding the printed sheet of paper we perceive that both first and fourth pages are together on the outside. *Why* is the third page to the left and the second to the right? Because the odd page in books is always to the right, and, in imposing, the pages must be reversed—hence it is placed to the left.

Notice also the sum of the two sets of numerals; 1 and 4 are 5, 3 and 2 are 5, and 5 is one more than there are pages in the sheet. This is a most convenient thing to remember, but its use will be seen more plainly hereafter when formes of many pages have to be dealt with.

Folio quirewise.—Folio sheets are sometimes required to be made up so that several of them may be folded within each other, or *quirewise*, as it is called.

The mode of imposing folio sheets quirewise is in principle the same as that already described. Each sheet consists of four pages, and these four pages are the first two and the last two in each sheet. Thus, if there be four sheets, or sixteen pages, the formes will be constituted in this way:—

1st sheet will contain pp.	1, 2, 15, 16
2nd	„ 3, 4, 13, 14
3rd	„ 5, 6, 11, 12
4th	„ 7, 8, 9, 10

The first sheet will be imposed as a sheet of folio, the outer forme consisting of pages 1 and 16, and the inner of pages 2 and 15.

The first and the last pages of type must be together because the impressions of these pages occupy the same side of the sheet; the next pages from each end, that is, 2 and 15, must make up the inner forme. The imposition then will be:—

FIRST SHEET QUIREWISE.

..... 1 .....	.....16.....	.....15.....	..... 2
.....
... Type ...	... Type ...	... Type ...	... Type ...
.....
.....

*Outer Forme.**Inner Forme.*

Here again you will notice that the numerals of the pages which adjoin each other exceed by 1 the total number of pages: $1 + 16 = 17$; $2 + 15 = 17$, and the same rule applies to all the other formes, thus $3 + 14 = 17$; $4 + 13 = 17$.

Imposing in quires may be carried to any extent by observing the following rules :—

1. Ascertain the number of pages.
2. Divide that number into so many sheets of folio.
3. Lay down on the imposing surface the first two pages of type and the last two. These form the first sheet.
4. Proceed in the same manner to the centre one, always remembering that the odd pages of type stand on the left and the even on the right, the folios of each two forming one more than the number of pages in the work.

Example : A work consists of thirty-six pages, in nine sheets of folio. These should be laid down according to the following scheme :—

			<i>Outer Forme.</i>	<i>Inner Forme.</i>
1st Sheet	- - -	1	36	35 2
2nd „	- - -	3	34	33 4
3rd „	- - -	5	32	31 6
4th „	- - -	7	30	29 8
5th „	- - -	9	28	27 10
6th „	- - -	11	26	25 12
7th „	- - -	13	24	23 14
8th „	- - -	15	22	21 16
9th „	- - -	17	20	19 18

It is obvious that in imposing in quires all the work must be composed before any forme is made up. This is frequently a drawback to the adoption of the plan ; moreover the binding of sheets so worked is clumsy when many sheets are quired, so in practice the plan is never adopted for works of more than a few pages.

Quarto.—If you open out an uncut ordinary eight-page newspaper, you will perceive that the pages are, when

printed, arranged thus, beginning with the side that contains the first page :—

.....
.....
.....
... Print ...	... Print ...
.....
.....
..... 5 .....	..... 4
..... 8 .....	..... 1
.....
... Print ...	... Print ...
.....
.....
.....

Then if the paper is turned over so that the second page is visible, the arrangement is :—

.....
.....
.....
... Print ...	... Print ...
.....
.....
..... 3 .....	..... 6
..... 2 .....	..... 7
.....
... Print ...	... Print ...
.....
.....
.....

The pages of type must, to print in proper order, be reversed ; hence the outer forme will be arranged so that 1 will be at the lower left-hand corner and 8 at the lower right-hand corner. Then, as in the printed sheet, 4 is over 1, but with its foot turned round the opposite way, 4 goes above 1 in the imposition of the pages of type, and 5 necessarily stands above 8. The inner forme follows the same rule, hence we get the scheme for a *Sheet of Quarto*.

This imposition follows the same rule as the previous ones, and a little thought will soon solve any difficulty that may arise in regard to any part of it. Observe that the sum of the folios of each pair of pages is 17, *i.e.*, one more than the number of pages in the sheet.

16mo.—A Sheet of Sixteens is equivalent to eight sheets of folio so imposed that when the printed sheet is folded the pages shall follow in regular order.

IMPOSITION FOR A SHEET OF SIXTEENS.

[illegible]

Outer Forme.

[illegible]

Inner Forme.

Observe that the sum of the folios of each pair of pages is 33, *i.e.*, one more than the number of pages in the sheet.

Half-sheet Work.—In order to get formes quickly to press, or to save time in working, or where the fount of

type is limited, or for other reasons, pages are often imposed so that the whole of them belonging to one section of the book (say pp. 1 to 4 in 4to, or 1 to 8 in 8vo) are in one chase. The sheet is printed first on one side and then on the other, being turned in the latter case, so that the pages which in the original kind of imposition would constitute the outer forme "back" the pages which in that kind of imposition would be the inner forme. When this is done there are two sets of the pages on the sheet, and on its being cut in halves two perfect copies of the work are obtained from it. We give specimens of three impositions of this kind: half-sheet of quarto, half-sheet of octavo, and half-sheet of sixteens.

The *Half-sheet of Quarto* is simply a sheet of folio imposed in one chase. Two copies are impressed on the one sheet of paper, which is afterwards cut in two and the parts separated.

IMPOSITION FOR A HALF-SHEET OF QUARTO. (4 pp.)

..... 7 .....	..... ..... ..... ..... ..... ..... ..... 8
..... 1 B	..... 4

The *Half-sheet of Octavo* is a sheet of quarto imposed in one chase instead of two, and when cut through the middle each section forms an independent sheet of quarto, or, as it is commonly called, a half-sheet of octavo.

IMPOSITION FOR A HALF-SHEET OF OCTAVO. (8 pp.)

[illegible]

It will be observed that the above diagram is precisely the same as that for a sheet of quarto (see page 248).

The *Half-sheet of Sixteens* is a sheet of octavo imposed in one chase instead of two, the outer forme on one side of the short cross-bar of the chase and the inner on the other side of it, as will be seen from the scheme given on the next page.

bookwork ; that is, pages of which the width is less than the height, thus :—

..... 1

.....

.....

.....

.....

.....

.....

But there are many works in which the pages are less in height than in width, thus :—

..... 1

.....

.....

.....

.....

Printers call the usual shape "Portrait," and the broad shape "Landscape," because in pictures portraits are usually taller than they are wide, and landscape *vice versa*. We will now show how broad pages are imposed in half-sheets of 4to, 8vo, 16mo, and 32mo :—

HALF-SHEET OF QUARTO. BROAD PAGES.

.....
.....
.....
..... 7 .....	..... 8
..... 1 .....	..... 4
.....
.....
.....
B	

HALF-SHEET OF 32mo. BROAD PAGES.

2	18	26	7
15	18	23	10
14	19	22	11
3	30	27	6
4	29	28	5
13	20	21	12
16	17	24	9
1	32	25	8
11			

SHEET OF QUARTO. BROAD PAGES.

.....
.....
..... 4 .....	..... 5
..... 1 .....	..... 8
.....
.....

Outer Forme.

.....
.....
..... 6 .....	..... 8
..... 7 .....	..... 2
.....
.....

Inner Forme.

A sheet of octavo composed of such pages would be imposed the same way as the half-sheet of the 16mo, the eight pages to the left of the short cross-bar constituting the outer forme, and the others the inner forme.

CHAPTER XXIV.

IMPOSING.—Aids to the Memory in Placing the Pages—a Rule-of thumb Method.

Aids to Memory.—Before proceeding to the impositions of 12mo for sheets and half-sheets, which entail more thought than those for 8vo, 16mo, etc., and are subject to variations, let us consider the comparatively simple schemes we have already given. Even these will sorely tax the memory and the ingenuity of the beginner, for imposition is a difficult subject to master. Fortunately there are some means of aiding the memory.

Let it, then, be remembered that in the ordinary impositions for folio, 4to, 8vo, 16mo, 32mo, and 64mo :—

1. The *first page* of the sheet (or half-sheet) is always at the left-hand lower corner with the head away from you.

2. The *second page* of the sheet or half-sheet is as far as possible from the first in a direct vertical or horizontal line.

Sheets (or half-sheets) of 4, 16, or 64 pp.¹ have the second page *vertically* over the first, thus :—

4 pp.		16 pp.
2	8	2 ... 8
1	4	: :
		1 ... 4

¹ I.e., 4, 4 × 4, and 4 × 4 × 4.

Sheets (or half-sheets) of 8 and 32 pp.¹ have the second page on the same *horizontal* line with the first page, thus :—

8 pp.				32 pp.			
				7	...	...	8
7	...	8		:			:
1	...	2		:			:
				1	...	...	2

3. The *third page* of the sheet (or half-sheet) is at the top right-hand corner; except in full sheets of folio and octavo, when it occupies the right middle place on the lower line.

4. The *fourth page* is at the remaining corner, except in full sheets of folio and octavo, when it occupies the left middle place on the lower line.

5. Except in a full sheet of 8vo and a half-sheet of 64's, the *fifth* and *sixth pages* lie together mid-way between the fourth and third pages, and the *seventh* and *eighth pages* lie together mid-way between the second and first; thus :—

7	5	9	8		7		8
				or			
					7		6
					8		5
1	8	7	2		1		4

6. The *last page* of the sheet (or half-sheet) is always next to the first and on the right of it.

7. The *even-numbered page nearest the middle* of the sheet (or half-sheet) is placed head to head with the first page, e.g., in a half-sheet of 8vo the fourth page is head to head with the first, and in a half-sheet of 16mo the eighth page is head to head with the first.

¹ I.e., 8 and 8 × 4.

8. The row of pages nearest you (that containing the first page) has the heads *away* from you ; the row of pages furthest from you has the heads *towards* you.

9. In arranging any intermediate rows place heads to heads.

10. Place next to each corner page, on its right or left as the case may be, that page whose folio added to the folio of the corner page will make the same total as the sum of the folios of the first and last pages of the sheet (or half-sheet).

Thus, in a half-sheet of octavo or sheet of quarto the last page in sig. B is 16, and that figure added to the folio of the first page makes a total of 17. To make this total of 17 with folios of the other corner pages, page 2 (at the lower right-hand corner) must have page 15 next to it on its left ; page 3 (at the top right-hand corner) must have page 14 next to it on its left, and page 4 (at the top left-hand corner) must have page 13 next to it on its right.

So, in a full sheet of octavo, where the corners of the two formes are filled thus :—

24	21	22.....23
17	20	19.....18

the first and last pages of the sheet (17 and 32) added together make 49 ; therefore, to make the sum of 49, the pages to be put next to the corners are : 31 next 18, 30 next 19, 29 next 20, 28 next 21, 27 next 22, and 26 next 23. (Page 17 has already page 32 beside it by rule 6.) Or again, in a half-sheet of 16mo, where, according to rules 1 to 4, the corners are filled thus :—

7.....8
1.....4

and (by rule 6) page 16 is next on the right of page 1, to make the total 17 we must place 13 next to 4 on its left, 14 next to 3 on its left, and 15 next to 2 on its right.

11. The folio of each corner page of the formes and the page head to head with it must always make a total equal to the sum of the folio of the first page and the folio of the page head to head with it.

We know (by rule 7) what page to put head to head with the first page, and by adding the folios of these two pages together, we know at once what pages to place head to head with the pages at the other corners. Thus, in a half-sheet of 8vo (sig. B) the sum of the folios of the corner pages and the pages head to head with them must always be 5; in a half-sheet of 8vo it must be 5 also; in a half-sheet of 16mo it must be 9; in a full-sheet of 8vo it must be 9 also (the rule holds good for each corner of each forme); and in a half-sheet of 32's, or a full-sheet of 16's, it must be 17.

12. Taking each row of pages and going horizontally from left to right, or from right to left, the sum of the folio of the outer page of any row and the folio of the page next to it on its right or left as the case may be—and also the sum of the folios of the next two pages, and the next two pages, and the next two, and so on—is always the same as the sum of the folios of the first and last pages of the sheet (or half-sheet).

Take the schemes shown on pp. 251 and 252 for a sheet of octavo and a half-sheet of 16mo, the sum of the folios of each pair of pages taken horizontally is 17. Or take the scheme shown on p. 249 for a sheet of 16mo, which also does for a half-sheet of 32mo, the sum of the folio of each pair of pages taken horizontally is 33. And if in these last schemes the folio of the first page were 33 instead of 1, the rule would still hold good, for the sum of each pair would be 97.

Alternative Rules.—Mr. Davies, one of the very successful teachers at the Borough Polytechnic, suggests that those who find the foregoing rules too many for their memory may prefer the following substitute for Rules 4 to 12:—

Taking the 4-page imposition as the basis of the 16-page, and the 8-page as the basis of the 32-page imposition, it will be seen that as the 4 and 8-page constitute respectively the first quarter of the larger imposition, the second quarter will go head to head with the first, following it backwards, and the remaining half of the pages will go side by side with the first half, following the first half back to page 1 thus:—

16 pp.

8	9	14	3
7	10	11	6.
8	6	12	5
1	16	13	4
B			

32 pp.

4	29	28	5	9	27	30	3
13	20	21	12	11	22	19	14
31	17	23	10	6	24	18	25
1	32	26	7	8	25	31	2
B							

Pages head to head are either half the number of pages in the forme plus 1, or one and a half plus 1; thus in the 16-page forme the sum of the pages head to head is either 9 or 25 ($8+1$ or $16+8+1$).

Another Method of finding the Proper Impositions.—

The *Printers' Register* lately published a rule by a Mr. Parker which some have considered useful for the laying down of schemes of imposition. His method may be stated as follows: If you get into your head the positions of the pages for a half-sheet of 4to, and remember the method about to be stated, you need never be at a loss for the proper schemes for 8vo, 16mo, 32mo, or 64mo, for from the half-sheet of 4to you can gradually build up the others. The method is this:—

Take a piece of paper and rule on it a vertical line; on the left-hand side of this line write a scheme for the half-sheet, and on the right-hand side of the line lay down the same scheme reversed. Then multiply all the numbers by 2 (first page excepted) and deduct 1 from the doubles of what are the *odd* numbers in the original (left-hand) scheme and 1 from the doubles of what are the *even* numbers in the reversed (right-hand) scheme and you will have the full-sheet scheme required. Let us follow this out.

We start by having by heart the scheme for a half-sheet of 4to:—

2 3

1 4

We now want to know what is the proper imposition for a full sheet of 4to, or, what is the same thing—except that one chase is used instead of two—a half-sheet of 8vo.

We draw a vertical line and write down on the left-hand side of it our half-sheet of 4to and on the right-hand side of it the same thing reversed, thus:—

2	3	|	3	2
1	4	|	4	1

We now multiply every figure by 2 except the 1 in the left-hand scheme, and get—

4	6.	6.	4
1	8	8	2

We will now deduct 1 from that figure (6) in the left-hand scheme which is the double of what was originally an odd number (3), and 1 from those figures (4 and 8) which are the doubles of what were originally even numbers (2 and 4), and we get—

4	5	6	3
1	8	7	2

which is the true scheme for full-sheet 4to or half-sheet 8vo.

Having got this, if we want to get full-sheet 8vo or half-sheet 16mo, we proceed exactly as before. We write down

4	5	6	3	3	6	5	4
1	8	7	2	2	7	8	1

Then we double and deduct according to the rule, and we get—

8	9	12	5	6.	11	10	7
1	16	13	4	3	14	15	2

Outer forme.

Inner forme.

which is the ordinary scheme for full-sheet 8vo. The half-sheet 16mo (see p. 252) varies from the full-sheet 8vo in

having the pages imposed in four rows instead of two, thus :—

2	51	41	8
7	10	11	6.
8	6	21	5
1	16	13	4

that is to say, it is like a sheet of 8vo with the inner forme turned round and placed at the top of the outer.

Starting with this and pursuing the same course, we may easily get the scheme for full-sheet 16mo or half-sheet 32mo, and by repeating the process we may get full-sheet 32mo or half-sheet 64mo.

A Rule-of-thumb for all Impositions.—If the workman has no memory and does not care to exercise his intelligence, he may find the imposition he requires by following this rule :

First, fold a sheet of paper into the required number of leaves ; then mark each page with its proper folio, taking care not to cut the leaves entirely across ; then open the sheet and spread it out on the imposing surface. You will have the exact order of imposition if the pages faced the stone, but as they face upwards you have to reverse their order, that is, you make right and left change places.

CHAPTER XXV.

IMPOSING (*continued*).—Schemes of Imposition for 12mo, 18mo, and 24mo.

WE will now proceed to the somewhat more difficult impositions of sheets and half-sheets of 12mo, 18mo, 24mo, and 48mo. It will be remembered that in each of these there is a division of the sheet into thirds.

12mo.—Whenever it is desired to print twelve pages upon a side of a sheet of paper there are two ways in which the pages may be treated after printing: one is to keep the sheet intact and rely solely on folding for the due sequence of the pages in book form; the other is to sever one-third of the paper, with its pages, after printing, and then to insert those in the remaining pages after both sections have been folded. In the one case the sheet or half-sheet is said to be imposed “to fold,” or “without off-cut;” in the other it is said to be imposed “with off-cut.”

When a forme is to consist of 12mo, 24mo, or 48mo the short cross-bar of the chase is removed from its usual position in the middle to the notches nearer the top end, and in this way the space in the chase below the short cross-bar is made twice as large as that above it. This will be apparent on consulting one of the following diagrams.

If the pages are imposed for an off-cut the eight of them which are contained in the part of the chase below the cross-bar are imposed just as for a sheet [or half-sheet as the case may be] of octavo, and the four of them which are

contained in the part of the chase above the cross-bar are imposed as for a special sheet [or half-sheet] of quarto. It is usually the middle pages which are put in the off-cut, though the outer pages are sometimes placed there.

IMPOSITION FOR HALF-SHEETS OF TWELVES.

A. *With Off-cut.*

[illegible]

B. *To Fold.*

[illegible]

Observe that where there is to be an off-cut the heads of the pages constituting the off-cut are towards the cross-bar, while where the imposition is "to fold" these are towards the rim of the chase. The reason for this is apparent on a little reflection; the folding necessitates that in scheme B the pages in the top row and those in the middle row should be tail to tail; there is no necessity for this where

there is an off-cut, and accordingly, following the usual practice, the tails of the pages are placed next the edge of the sheet.

When scheme B is adopted care should be taken that the head margin of the pages above the short cross-bar (pp. 3, 10, 9, and 4) is rather less than half the head margin space between pp. 1 and 6, for if there is more than this the over-margin at the head of pages 3, 10, etc., will crease and buckle in on folding.

The student will notice that many of the rules given on pp. 256-9 hold good for these impositions. Obviously they do so in scheme A, because there we have but a half-sheet of octavo and a half-sheet of quarto in the chase, which is divided into two by the short cross-bar. But in scheme B we still have the first page at the left bottom corner, the second page at the right bottom corner, the last page next to page 1 on its right, the half-way page (p. 6) to head with page 1; the sum of the folios of the bottom corner pages and the folios of the pages head to head with them is always 7 (the sum of the folio of the first page and the folio of the page head to head with it); and the sum of a folio of a page next the side of the chase and the folio of the page horizontally next it is 13 (the sum of the folios of the first and last pages in the half-sheet). But it must further be noticed that the folio of each corner page in the smaller part of the chase is exactly two more than the folio of the corner page straight under it at the bottom.

The scheme of imposition for a sheet of 12mo to fold can readily be found from the half-sheet by the method given on pp. 261-3. It is as follows :—

A. HALF-SHEET OF 18's WITH OFF-CUT (NO TRANS-POSITION).

6.	7	18	17	5	8	17
4	9	16	15	3	10	15
1	12	13	14	2	11	14
B	C					

B. HALF-SHEET OF 18's WITH OFF-CUT AND TRANS-POSITION.

B ²	10	5	14	13	6.	9
4	12	15	7	3	16	7
1	11	18	8	2	17	8
B						

If scheme B is adopted, after the sheets have been printed on one side the forme must be unlocked and pp. 7 and 11 must exchange places, and pp. 8 and 12 must also exchange places.

24mo.—

HALF-SHEET OF TWENTY-FOURS WITH TWO SIGS.

12	13	16	9	10	15	14	11
8	17	20	5	6.	19	18	7
1	24	12	4	3	22	23	2
B							

It will be observed that this is the same imposition as that of the sheet of twelves shown on p. 269, only in one chase instead of two.

SHEET OF TWENTY-FOURS WITH TWO SIGS.

34	39	38	35	10	15	14	11
30	43	42	31	6	19	18	7
27	46	47	26	3	22	23	2
c ²				B ²			

Inner Forme.

12	13	16	9 ^{B*}	36	37	40	33 ^{C*}
8	17	20	5	32	41	44	29
1	24	21	4	25	48	45	28
B				C			

Outer Forme.

CHAPTER XXVI.

IMPOSING (*continued*).—Imposing from the Centre—Special Schemes
—Impositions for Folding Leaflets.

THOUGH all the ordinary schemes of imposing are found in the preceding pages, the exigencies of modern work often require that there should be some variations, and we accordingly append various schemes with which the experienced printer should be familiar, and which are placed here for convenience of reference. As before, to distinguish between the figures 6 and 9, the former is followed by a full point. The thick rule shows the short cross-bar of the chase.

Imposing from the Centre.—It sometimes happens that the inner pages of a forme contain solid matter or cuts, while the outer pages are light or “open,” and when this is the case the pressman likes to have the solid pages on the outside, so as to “bear off” the impression from the middle pages. Here, then, are schemes for such impositions :—

TWO HALF-SHEETS OF QUARTO IMPOSED FROM THE
CENTRE.

4	B 1	2	3
3	2	1 B	4

(272)

A HALF-SHEET OF OCTAVO IMPOSED FROM THE CENTRE.

9	8	7	5
7	2	1	8
		B	

A SHEET OF OCTAVO IMPOSED FROM THE CENTRE.

21	5	8	6
13	4	1	16
		B	

Outer Forme.

10	7	9	11
15	2	3	14
		B ²	

Inner Forme.

HALF-SHEET OF SIXTEENS IMPOSED FROM THE CENTRE.

21	5	8	6
13	4	1	16
		B	
14	3	2	15
11	6	7	10

SHEET OF TWELVES IMPOSED FROM THE CENTRE.

16	B [*] 9	12	13
20	5	8	17
21	4	1	24
		B	

Outer Forme.

15	10	11	14
19	6	7	18
22	3	2	23
	B ²		

Inner Forme.

We now give some other impositions occasionally used :—

A SHEET OF OCTAVO OF HEBREW WORK.

<i>Outer Forme.</i>				<i>Inner Forme.</i>			
1	9I	8I	7	8	7I	6I	5
8	9	12	5	6.	11	10	7

Hebrew, it is to be remembered, reads from right to left, therefore the ordinary imposition is reversed.

A SHEET OF OCTAVO, 12 OF ONE WORK, AND 4 OF OTHER MATTER.

<i>Outer Forme.</i>				<i>Inner Forme.</i>			
II	III	8	9	9	12	11	10
1	12	9	4	3	10	11	2
B							

Other combinations can be easily worked in the same manner. For instance, one 8 pp. and two 4 pp.—one 4 pp. as this, and the other occupying the places of 5, 6, 7, 8—the first page commencing on 5, transferring page 5 to where 9 is placed, and so on.

The following is for a folding machine working “left-handed” :—

SPECIAL SHEET OF OCTAVO.

<i>Outer Forme.</i>				<i>Inner Forme.</i>			
9I	1	7	8I	7I	8	5	6I
9	8	5	12	11	6.	7	10

HALF-SHEET OF TWELVES, WITH TWO SIGNATURES.

8 pages of one work and 4 of another.

!!	!!!	AI	<i>v</i> !
4	5	9	8
1 c	8	7	2

This imposition is practically a half-sheet of 8vo and a long four worked together to save runs at a machine. The pages may consist of two separate jobs or portions of the same work.

A SHEET OF TWELVES, WITH TWO SIGNATURES.

*Outer Forme.**Inner Forme.*

20	21	24	^s 17	18	23	22	19
8	9	12	5	6	11	10	7
1 B	16	13	4	3	14	15	2

Although imposed as a sheet of 12's, this scheme, if carefully examined, will be seen to be a sheet of octavo and a "long 8" put together for convenience of working. If necessary, it may consist either of parts of the same work or of two distinct jobs.

TWO HALF-SHEETS OF TWELVES (WITH OFF-CUTS)
WORKED TOGETHER.

9	L	9	L	8	S	8	S
4	6	4	6	10	3	10	3
1	12	1	12	11	2	11	2

HALF-SHEET OF SIXTEENS FOR QUIRING.

2	15	10	L
3	14	11	6.
4	13	12	5 ^{B*}
1 ^B	16	6	8

This is equivalent to two half-sheets of octavo, one quired (to inset) in the other ; the object is to avoid the creasing so likely when much folding of the sheet has to be done.

FOUR SHEETS OF SIXTEENS WORKED TOGETHER.

When large machines, such as quad-royal, are available, it is possible, and often economical, to work, as a sheet of 64's, four sheets of sixteens, by treating each quarter of the chase as if it were a separate chase so far as imposing is concerned. In this way we may, if we get the pages electrotyped or stereotyped, print four copies at one impression ; or we may at each impression print the outers or inners, as the case may be, of four distinct sheets, either of the same work

or of different works. Obviously the same sort of thing can be done where only two sheets of sixteens were imposed to work together, and, with a little careful thought, all the many possible varieties of imposition may be carried out in the same way.

These formes are sometimes imposed so as to fold "two on," with the result that when cut through, two complete copies are produced, thereby saving half the cost of folding, besides a considerable saving of time in stitching.

SPECIAL SHEET OF SIXTEENS.

The following is intended for a folding machine working "left-handed":—

21	12	02	13
5	28	29	4
8	25	32	1
9	24	17	16

Outer Forme.

14	19	22	11
3	30	27	6
2	18	26	7
15	18	23	10

Inner Forme.

HALF-SHEET EIGHTEENS WITHOUT OFF-CUT HEADS.

3	14	11	12	13	4
9	7	01	6	8	5
1	18	15	16	17	2

This is intended to fold so that it may all be stitched together. Care must be taken in working that sufficient margin is left to turn in for stitching at pages 11, 10, and 15. This does not improve the appearance of the sheet when folded, but is necessary in some kinds of cheap work.

SHEET OF EIGHTEENS WITH TWO SIGNATURES.

12	13	16	8 ^B 6	14	11 ^A
8	17	20	5	15	10
1	24	21	4	1	12 ^B
B				a	

Outer Forme.

11 ^A	10 ^B 9	10	15	14	11
x	11 ^B	6	16	18	7
xi	12	3	22	23	2
		B2			

Inner Forme.

This is actually a sheet of 12's with cut-off, and half a sheet of the same worked together. It might be advantageous, in order to save the cost of working, to impose together in this manner, if there were a sufficient number of "runs" to admit of it.

SHEET OF EIGHTEENS WITH THREE SIGNATURES.

9	L	IV	III	9	L
4	6	IV	IX	4	6
1	12	i	xii	1	12
B		a	c		

Outer Forme.

8	CO 5	III	2V V	8	5 2B
01	3	x	III	01	3
11	2	xi	ii	11	2

Inner Forme.

This is three half-sheets of 12's imposed together for working in two formes.

HALF-SHEET OF TWENTIES.

3	18	17	4
9	51	91	5
7	14	13	8
01	11	12	6
1	20	19	2

It may be noticed in the lay-down of these pages that the same rule as previously referred to applies as to head margin at 3, 18, etc., and that the first folding is only a single line of pages turned in. The folding afterwards is like that of an ordinary half-sheet of 16's.

SHEET OF TWENTIES.

3	38	31	10	9	32	37	4
9	33	13	7	8	33	33	5
17	24	25	16	15	26	23	18
27	17	28	11	14	27	22	19
1	40	29	12	11	30	39	2
<i>Outer Forme.</i>				<i>Inner Forme.</i>			

This imposition is so arranged that the first fold is only one line of pages (pp. 3, 38, etc., turned in), and then the folding is like an ordinary sheet of 16's. In working, the rule mentioned in the previous imposition holds good as to the lay at pages 3, 38, etc., which must be half only of the head margin.

SHEET OF TWENTY-FOURS WITH TWO SIGNATURES.

33	40	37	36	9	16	13	12
B5				A5			
29	44	41	32	5	20	17	8
B3				A3			
28	45	48	25	4	12	24	1
B				A			

Outer Forme.

11	14	15	10	35	38	39	34
A6				B6			
7	18	19	6.	31	42	43	30
A4				B4			
2	23	22	3	29	47	49	27
2V							B2

Inner Forme.

HALF-SHEET OF TWENTY-FOURS, THE SIXTEEN WAY.

9	16	3	22	23	2
B*					
12	13	9.	19	18	7
11	14	5	20	17	8
10	15	4	12	24	1
					B

In this plan, when worked off and the paper is cut, there will be 16 pp. or a sheet of 8vo and 8 pp. inset or half-sheet. Of course, these may either be portions of the same job or different works.

HALF-SHEET OF SIXTY-FOURS.

2	39	43	13	92	63	85	7
15	50	47	18	23	42	55	10
41	51	46	19	22	43	54	11
3	62	35	30	27	38	59	6.
4	19	36	29	28	37	60	5
13	52	45	20	21	44	53	12
16	49	48	17	24	41	56	9
1	64	33	32	25	40	57	8

Folding Leaflets.—The printing of leaflets or formes of six, eight, ten, or twelve pages to fold to the size of a single page, without stitching, so as to read continuously, has of late years become very common. We therefore subjoin a few schemes, showing the different positions of the first page in the forme, which is guided entirely by the taste or choice of the customer. Taking the position of the first page as a guide, the pages are imposed either in a row, heads on a line, or head to head, running from the first page to the right on the lower row of pages, and then from right to left on the upper row, until the forme is filled, the manner

of imposition depending on the length of the forme or the way in which the paper to be printed will be cut to the best advantage.

SIX-PAGE FOLDING LEAFLET—*First page in Centre.*

6. 1 2 3 4 5

SIX-PAGE FOLDING LEAFLET—*First page to the Left.*

1 2 3 4 5 6.

SIX-PAGE FOLDING LEAFLET—*First page to the Right.*

2 3 4 5 6. 1

SIX-PAGE FOLDING LEAFLET—*Another Scheme.*

7 8 4

1 6. 5

EIGHT-PAGE FOLDING LEAFLET—*First page next to the Left.*

L 9 5 4

8 1 2 3

EIGHT-PAGE FOLDING LEAFLET—*First page to the Right.*

9 4 8 7

6. 7 8 1

EIGHT-PAGE FOLDING LEAFLET—*First page to the Left.*

8 L 9 5

1 2 3 4

EIGHT-PAGE FOLDING LEAFLET—*Another Scheme.*

7 8 4 9

1 8 7 6.

Twelve- and sixteen-page folding leaflets can be imposed similarly in two rows by placing page 1 at the left hand of the lower row, page 2 vertically above, and then running in numerical order towards the right in the upper row and afterwards towards the left in the lower.

CHAPTER XXVII.

SIGNATURES.—Their nature and use—Alphabetical Signatures—
Numerical Signatures—Tables.

Signatures.—The reader is now in a position to understand the nature and use of the signatures which, as we stated on p. 237, were to be found on the sheets constituting books. They are either alphabetical or numerical.

If you take up an ordinary book you are almost sure to find that at the foot of certain pages in it there is a letter, and at the foot of others a letter and a figure, as B, B2. Open a few more pages and you will find another letter, and if you go through the book it will be seen that—

1. These letters are in regular alphabetical order.
2. They occur at regular intervals of eight, twelve, sixteen, etc., pages.

These letters are called *signatures*, and their use is—

(a) To designate the sheets of which the book is composed. We may refer to a sheet and call it signature N, for example, and know and indicate exactly the pages of which it consists.

(b) To assist the compositor not only in imposing a forme, but in designating the formes, and distinguishing one from another. The signature is invariably preferred to the page for purposes of reference.

(c) To assist the pressman, who perfects his sheets by their aid. Also, to distinguish the outer and inner formes.

(d) To assist the binder in *folding*. This it does, because the signature occupies a certain specified place

in every sheet, and it is only necessary that the folding is done so that the signature is in a certain position to know that it is done properly, without going through all the folios.

(e) To assist the binder in *gathering*, that is, in collecting together the sheets so that they fall in proper order, as well as in *collating*, that is, examining whether the gathering has been properly done. If the letters fall in their due alphabetical order, the sheets must be right; it is not necessary to ascertain the sequence of the pages.

Two points in regard to signatures must be noted—

1. There is no signature A; that would have to be on the title-page, but would be unsightly if placed there. Besides it is not necessary; for the title-page itself indicates how the sheet must be folded.

2. There is no signature J, V, or W. This has arisen from the fact that when signatures were first used I and J were employed indiscriminately, as was also the case with U and V, while W was written UU or VV.

In some offices, however, J only is omitted, making the alphabet to consist of twenty-five letters, which is a convenient number, being a quarter of a hundred. In others, again, the whole alphabet is used in consecutive order.

If the book contains more sheets than the alphabet will suffice to indicate, a second alphabet is resorted to, which is distinguished by a figure 2 being prefixed thus, 2A, 2B, 2C, 2D, and so on. If a third be required, the figure 3 precedes the letters, as 3A. Where the book is not a bulky one, the alphabet is often duplicated for the second series of signatures, thus, AA, BB, or Aa, Bb.

Signatures are usually in small caps of the same body as the page; they should be at the foot of the page, and are variously placed about $\frac{1}{2}$ an inch from the right or the left

hand side of the page, according to the style of the house. They are always placed in the white line.¹

If the book is in two volumes, each of them should have a separate independent sequence of signatures; but near the left-hand corner of the line the volume should be named; as, VOL. II.

These signatures are used for the *first* page only of each sheet. There are others inserted at the bottom of other pages, but the same letter is used throughout the sheet, however many signatures there may be. In the latter case a figure is placed *after* the letter, as B2, B3, B4, etc.

Thus 2B means the B of the second alphabet, B2 a second use of the letter B in the first alphabet.

It is necessary to have different numbers of signatures on each sheet for different impositions, in order that the folding may be correct.

The rules on this point are :—

Octavos have two signatures to each sheet, one on the first and the other on the third page of the sheet, thus: B on page 1, and B2 on page 3; c on page 17 and c2 on page 19. The second signature is not an actual necessity for the folder, as the first page of each sheet is the guiding page, and it is merely printed when the sheet of 8vo is in two formes to distinguish the outer and inner formes. When worked in one forme, as a half-sheet of 16mo, one signature only is required. A half-sheet of 8vo, too—*i.e.*, a sheet of quarto with all its eight pages in one forme—has only one signature, B, C, D, etc.

Twelves have three signatures—one on the outer forme,

¹ It is customary in houses where much bookwork is done to place on the left-hand corner of the first page of each sheet, and opposite to the signature, a contraction of the title of the book in even small caps as PR. PR. (Practical Printing). The object is to lead to an easier identification of the forme by the compositor and pressman. In some books the title is given in full, in italics.

one on the inner forme, and one on the off-cut (the ninth page of the sheet). Thus the first sheet will bear B on page 1, B2 on page 3, and B3 on page 9; the second sheet will bear c on page 25, c2 on page 28, and c3 on page 33. A half-sheet of 12mo would have two signatures—the main signature on the first page of the sheet, and the subsidiary signatures on the first page of the off-cut, which is the fifth page of the sheet, *e.g.*, B on page 1 and B3 on page 5, c on page 13, and c3 on page 17.

Eighteens are frequently printed as three half-sheets of twelves, distinct from and independent of each other. Each of these sections has its own signature. Thus, to a sheet of this kind, the signature would be the same as those given for a half-sheet of 12mo. A half-sheet of 18mo is of no practical value.

When the signature is printed to a leaf, the sheet or page is said to be *signed*; when not printed, it is *unsigned*.

The preceding system of signatures has been in use almost since the invention of printing, varying, of course, with the kind of sheets imposed. Thus, when the sheets were cut up before being worked, there was a difference in the arrangement necessary. The duodecimo, also, is a comparatively modern size, and was not known to the first printers. The writers, who preceded the printers, used signatures for convenience of collation.

Numerical signatures are now often employed, as they are more explicit than alphabetical ones. The sheets are numbered throughout the volume as 1, 2, 3, and so on, the figures being placed invariably at the foot of the *first* page. Sometimes the subsidiary signature for the third page of the sheet, etc., is omitted, but when printed it figures as 1*, 2*, etc. The off-cut is distinguished by one or more asterisks (*) being added to the figure, one when there is no subsidiary signature for the third page of the sheet, two when there is. A * signature is

always placed on the first page of a section that is to be insetted.

A system has been adopted of printing the signature in some books so low down on the leaf that it will be *cut off* when the book is trimmed, or cut in the edge by the binder. This plan was adopted by the scribes, and has led to the common error that their leaves were unsigned. It is done to improve the appearance of the page, but cannot be recommended; for the book may require to be rebound, when there will be no indication of the beginning of the section available for the purposes of the bookbinder, nor any assistance in the collation of the sheets in their proper order.

NOTE.—The ordinary subsidiary signature (B2, c2, etc., or 1*, 2*, etc.) is placed on the third page of each sheet, *e.g.*, in 8vo the subsidiary signature of the tenth sheet would be L2 (or 10*) and be on page 148; in 12mo the signature for the off-cut falls on the ninth page of each sheet; in half-sheet 12mo it falls on the fifth page of each sheet.

TABLE OF SIGNATURES.

No. of Sheet.	Signature.	Page on which the Signature falls.				
		Folio.	Quarto.	8vo.	12mo.	16mo.
	A	0	0	0	0	0
1	B	1	1	1	1	1
2	C	5	9	17	25	33
3	D	9	17	33	49	65
4	E	13	25	49	73	97
5	F	17	33	65	97	129
6	G	21	41	81	121	161
7	H	25	49	97	145	193
8	I	29	57	113	169	225
9	K	33	65	129	193	257
10	L	37	73	145	217	289
11	M	41	81	161	241	321
12	N	45	89	177	265	353
13	O	49	97	193	289	385
14	P	53	105	209	313	417
15	Q	57	113	225	337	449
16	R	61	121	241	361	481
17	S	65	129	257	385	513
18	T	69	137	273	409	545
19	U	73	145	289	433	577
20	X	77	153	305	457	609
21	Y	81	161	321	481	641
22	Z	85	169	337	505	673
23	2A	89	177	353	529	705
24	2B	93	185	369	553	737
25	2C	97	193	385	577	769
26	2D	101	201	401	601	801
27	2E	105	209	417	625	833
28	2F	109	217	433	649	865
29	2G	113	225	449	673	897
30	2H	117	233	465	697	929
31	2I	121	241	481	721	961
32	2K	125	249	497	745	993

NOTE.—The above Table, which has been prepared for full-sheet work, can be used for half-sheet work, it being remembered that half-sheet 4to is folio, half-sheet 8vo is 4to, half-sheet 16mo is 8vo, and half-sheet 24mo is 12mo.

It can also be used for numerical signatures, for these signatures correspond with the number of the sheet, *e.g.*, the numerical signature for the fifth sheet is 5 instead of F, and in 8vo, or half-sheet 4to, it falls on page 65.

On the preceding page is a table of signatures for the most useful impositions, extending as far as any ordinary volume. If more signatures are required they can easily be calculated.

It will be noticed that the first signature A is not folioed in *Arabic* numerals. It generally consists of title, preface, contents, introduction, etc., and is folioed in *Roman* numerals, as i, ii, iii, iv, v, etc.

When the introductory matter extends over more than one sheet, its signatures are usually printed in lower-case italic letters.

As works are frequently imposed in *half-sheets*, we give a table of numerical signatures for half-sheets for convenience sake; the figures with the asterisk indicate the first page of each off-cut.

NUMERICAL SIGNATURES.—*Half-Sheets.*

8vo.			12mo and 18mo.			16mo.			24mo.		
Page.		Sig.	Page.		Sig.	Page.		Sig.	Page.		Sig.
1	...	1	1	...	1	1	...	1	1	...	1
9	...	2	5	...	1*	17	...	2	9	...	1*
17	...	3	13	...	2	33	...	3	25	...	2
25	...	4	17	...	2*	49	...	4	33	...	2*
33	...	5	25	...	3	65	...	5	49	...	3
41	...	6	29	...	3*	81	...	6	57	...	3*
49	...	7	37	...	4	97	...	7	73	...	4
57	...	8	41	...	4*	113	...	8	81	...	4*
65	...	9	49	...	5	129	...	9	97	...	5
73	...	10	53	...	5*	145	...	10	105	...	5*
81	...	11	61	...	6	161	...	11	121	...	6
89	...	12	65	...	6*	177	...	12	129	...	6*
97	...	13	73	...	7	193	...	13	145	...	7
105	...	14	77	...	7*	209	...	14	153	...	7*
113	...	15	85	...	8	225	...	15	169	...	8
121	...	16	89	...	8*	241	...	16	177	...	8*
129	...	17	97	...	9	257	...	17	193	...	9
137	...	18	101	...	9*	273	...	18	201	...	9*
145	...	19	109	...	10	289	...	19	217	...	10
153	...	20	113	...	10*	305	...	20	225	...	10*
161	...	21	121	...	11	321	...	21	241	...	11
169	...	22	125	...	11*	337	...	22	249	...	11*
177	...	23	133	...	12	353	...	23	265	...	12
185	...	24	137	...	12*	369	...	24	273	...	12*
193	...	25	145	...	13	385	...	25	289	...	13
201	...	26	149	...	13*	401	...	26	297	...	13*
209	...	27	157	...	14	417	...	27	313	...	14
217	...	28	161	...	14*	433	...	28	321	...	14*
225	...	29				449	...	29			
233	...	30				465	...	30			
241	...	31				481	...	31			
249	...	32				497	...	32			
257	...	33				513	...	33			

CHAPTER XXVIII.

BOOKWORK (*continued*).—Making up the Forme—the Chase—the Cross-bars—Making the Margin—Dressing the Chase—Preparing for Press.

WE now assume the reader to be at work again in the practice of his art, and to be about to make up a forme. Having made up his matter into pages and slid them off the galleys on to the imposing surface, he arranges them in order thereon according to the size and nature of the forme he has to make up. This done, he should examine the folios and signatures to see that they are correct and that the imposition agrees with that scheme in the preceding pages which applies to the case. If there is any error in position it may now be easily remedied; but after the forme is locked up the rectification will be more troublesome.

He must now place the pages of matter, as nearly as can be estimated without measurement, at the proper distance apart to correspond with the margin intended.

Each printed page has a margin all round it. That at the top is called the "head" margin, that at the bottom the "tail"; while of the two side margins, that which is in the fold of a book (where the stitching is) is called the "back," and the other the fore or "gutter" margin. These margins are determined by the distances the printed pages are kept apart.

Enchasing.—Now procure a pair of chases of the size necessary for the forme; that is, sufficiently large to contain the pages and to allow some space all round for the locking-up.

Place the chase round the pages. In the diagrams explaining the method of “making margin”¹ the position of the chase and its bars in relation to a forme of sixteen pages will be seen. This is the principle adopted in selecting chases for all formes, except the 12mo, 18mo, and their multiples. The bars are in the centre, and when both are used they divide the space enclosed by the chase into four equal parts.

In the sheet of 12mo, as before stated, the short bar does not cross the middle of the chase, as it does in an 8vo sheet. It is placed in the upper notches of the chase, and is crossed in the middle by the long bar, which should always be put in last.

Head, Tail, Back, and Gutter.—The appropriate parts of book formes have names corresponding with those of the margins before mentioned.

A HALF-SHEET OCTAVO FORME.

[illegible]

¹ *Post*, pages 300 and 301.

The *head* is the space forming the margin at the top of the page when printed.

The *tail* is the bottom space below the type.

The *back* is that space between the sides of two adjoining pages of print which constitutes the back of the book when printed and folded.

The *gutter* is that space between the sides of two adjoining pages which, when the sheet is printed and folded, constitutes the fore edge.

The cross-bars of the chase when used always form parts of the margin spaces.

The chase being now round the matter, and the cross-bars in their place, the next operation is *Making the Margin*, or putting the pages the proper distance apart and filling up the spaces with furniture.

Calculating the Margins.—The page of type should not fall exactly in the centre of the page of paper, because, among other reasons, the fore edges and the heads and tails are cut down, or “trimmed,” when the book is bound; and apart from this, it is generally thought better to have more margin at the fore edge than at the back, and also rather more at the tail than the head.

A good rule is to let the width of the fore edge, before trimming, be fully half as large again as that of the back margin, and the depth of the tail before trimming half as large again as that of the head.

To determine the width of the various margins for a work, the best way to proceed is this: Take a two-foot rule or a type scale, and a sheet of the paper to be used in printing the work. Fold the latter until it is of the size of a page of the work; then measure it and jot down the results. Afterwards measure a page of the type from head to foot, and from side to side; put these measurements down also. Let *a* be the measure of the page of paper from top to bottom, and *b* its measure from side to side, and let *a'* be the

measure of the page of type from head to foot, and b' the measure of it from side to side.

Then by deducting a' from a we have the number of inches (or ems as the case may be) which may be devoted to the head and tail of the page, and by deducting b' from b we have the number of inches (or ems) available for the back and fore edge of the page. Let the former space be x and the latter y ; then by the rule before mentioned the head margin of the page should be $\frac{2}{5}$ and the tail $\frac{3}{5}$ of x , and the back margin of the page should be $\frac{2}{5}$ and the fore edge $\frac{3}{5}$ of y .

A HALF-SHEET 12Mo FORME.

[illegible]

Let us illustrate by this present book. The size of a page of the paper (Large Post octavo) untrimmed is $8\frac{1}{4}$ by $5\frac{1}{4}$ inches; the size of a page of the type is $5\frac{3}{4}$ by $3\frac{1}{2}$ inches. Putting $8\frac{1}{4}$ for a , and $5\frac{3}{4}$ for a' , and proceeding as directed, we find that x , the space available for the head and tail margins of the page, is $2\frac{1}{2}$ inches (*i.e.*, $8\frac{1}{4}$ less $5\frac{3}{4}$ inches); while, putting $5\frac{1}{4}$ for b , and $3\frac{1}{2}$ for b' , we find that y , the space available for the back margin and fore margin of the page, is $1\frac{3}{4}$ inch (*i.e.*, $5\frac{1}{4}$ less $3\frac{1}{2}$ inches). Divide each of them into fifths; the head margin of the page should be full two-fifths of $2\frac{1}{2}$ inches, or fully 1 inch; and the tail three-fifths of $2\frac{1}{2}$ inches, or $1\frac{1}{2}$ inch; while the back margin of the page should be about two-fifths of $1\frac{3}{4}$ inch, or $\frac{3}{4}$ of an inch, and the fore edge should be about three-fifths of $1\frac{3}{4}$ inch, or 1 inch.

Hence we may lay down the following *Rules* :—

1. *To determine the head and tail margins.*—Ascertain the difference between the length of the page of paper and the length of the page of type, and divide that difference into fifths. Apportion two-fifths to the head and three-fifths to the tail.¹

2. *To determine the back and fore edge margins.*—Ascertain the difference between the width of the page of paper and the width of the page of type, and divide that difference into fifths. Apportion two-fifths to the back and three-fifths to the fore edge.

The margins having been thus calculated and determined, it is well to get a piece of cardboard and convert it into a gauge, by notching it, so as to show the exact measures of the head, tail, back, and gutter respectively; but in each case the *double* of the widths already found. The reason for this is that in the forme the heads and backs, etc., of

¹ Some printers make the head margin only one-fourth less than that of the tail, and hence divide the space available for both by 7, allowing three-sevenths for the head, and four-sevenths for the tail.

two pages are together, and it is the double space which usually has to be provided for.

When the number of formes exceeds three or four, it is better to have a more substantial gauge than one of card, which may get injured with frequent handling. Hence pieces of reglet or old leads are cut to the exact sizes required, and marked to identify them, and after having a hole put through them are strung together, and kept for use when required.

You have now to calculate the furniture wanted for insertion between the pages. Possibly the exact space cannot be made with furniture alone, but reglet will be wanted also for adjustment. Remember that part of the space between certain of the pages is already occupied by the cross-bars of the chase. The width of these must be taken into account when reckoning the furniture wanted.

Take the half-sheet octavo forme shown on page 293. We will assume it to be a forme of this present work, and we have already calculated the margins of the pages to be: Head, 1 inch = 6 ems pica; tail, $1\frac{1}{2}$ inch = 9 ems; back, $\frac{3}{4}$ inch = $4\frac{1}{2}$ ems; and fore edge, 1 inch = 6 ems.

Now, for the backs we shall want proper lengths of furniture 9 ems wide. We shall either use metal furniture of (or making up) this width, or pieces of wood furniture side by side. A piece of "narrow" (3 ems) and a piece of "double narrow" (6 ems) side by side will exactly make up the 9 ems wanted. The gutters and the short cross-bar together must be 12 ems wide, but the cross-bar itself is (say) 6 ems wide; therefore, what is wanted is a piece of "narrow" (3 ems) on either side of it. Similarly, the heads and the long cross together must be 12 ems wide, and if the long cross is 6 ems wide, a piece of "narrow" furniture on either side of it will give the correct margin. The tails will be provided for by the side and foot sticks and quoins—in this forme they need not be taken into account; though in

such a forme as that on p. 295, those at the feet of pp. 4, 9, 10, and 3 must be accurately adjusted with furniture.

Having determined the widths and lengths of the furniture and side and foot sticks wanted, these and some quoins must now be obtained from their places in the composing room or from the store room, either by yourself or by the compositor whose business it is to look after these things, and who is called the "quin drawer overseer." It is not improbable that the saw and block will be required to cut pieces to the proper lengths.

Dressing the Chase.—*Put in furniture*, so that the pages (irrespective of the string which now temporarily surrounds them) will be the proper distance apart. Metal furniture is preferable to wood furniture, but if the latter has to be used it is best to put it in the gutters and backs.

The furniture for the gutters should be a little longer than the pages. It is a good plan to let the head furniture extend beyond the width of the pages, so as to keep the head-lines rigid and the folios at the end secure.

Now put in the sidesticks. They should be a little longer than the pages. The footsticks should now be put in, and they must be a little shorter than the width of the type. There must be only one sidestick and one footstick in each section of the chase,¹ providing there are not more than four pages (say 8vo) in each section; if more, then have one side and one foot stick to each two pages—each section, in fact, being treated for locking-up purposes as a separate chase. The direction in which the side and foot sticks must run is shown in the diagrams for testing margins. Should the type not reach to within a short distance of the chase, furniture, known as "packing," must be interposed between it and the side and foot sticks to enable it to be locked up.

Now untie the pages. In removing the page cords, begin

¹ The chase is divided into two or four sections by the cross-bar or cross-bars, each section having an iron boundary.

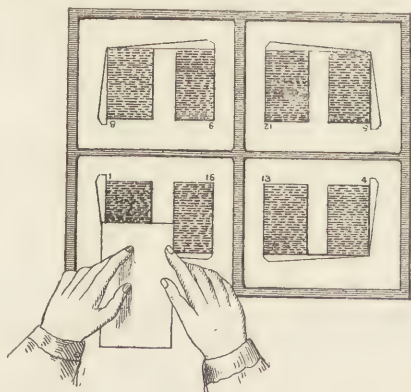
with the pages next to the bars. Take hold of the protruding end of the cord with one hand, laying the other flat on the page to prevent the letters rising. Unwind the cord, and close up the page by pressing the sidestick and footstick against it. Fasten up a little more, by pushing the quoins up with the fingers. Coil up the cord and preserve it for future use.

Next *select and put in the quoins*.¹ These should be put in slackly, being pushed up only with the fingers, until the margins and furniture have been tested and everything found to be correct.

Testing the Margins.—Now take your cardboard or other gauge and apply it to the various parts; the distances between the pages should be exactly those indicated by the notches.

Other tests may be made as follows: Take a sheet of the paper on which it is intended to print the work (technically called "a sheet of its own"), and use it as now directed.

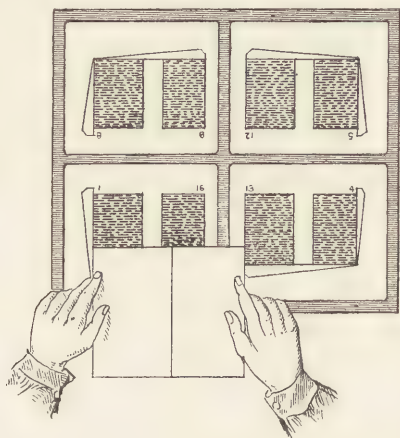
To test the width of the Backs.—Fold the sheet to the size of the work, *i.e.*, into octavo in the case in question;



¹ If mechanical quoins are used, some of these directions will be inapplicable.

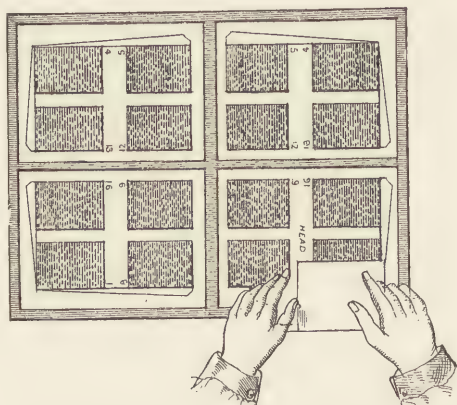
put the long fold against the left edge of the last page of the work (*i.e.*, page 16 in the cut), and let the paper extend towards the left; it should cover page 1, and extend a pica or great primer beyond it to allow for the trimming when the book is being bound. Then measure the distance between the pages; whatever the number of ems, the same space must be preserved in all the backs throughout the sheet.

To test the width of the Gutters.—Open the sheet one fold, and measure from the left side of the third page to the

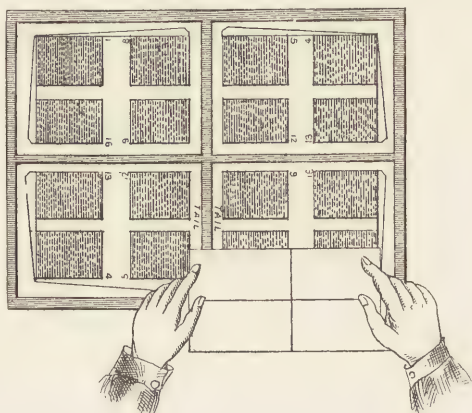


right (in an octavo forme the 13th page) to the left side of the first page; the distance should be the exact length of the paper, or "full out" as it is sometimes called.

To test the width of the Heads.—Fold the sheet to the size of the work, and measure from the head of the page nearest the top of page 1—which in an octavo forme will be the 8th page—letting it extend over page 1; it should cover page 1 and extend a pica or two beyond it to allow for trimming.



To test the width of the Tails.—Open the sheet the contrary way to that in which it has been opened to test the backs, then measure from the foot of the third page to



the foot of the first page; the distance should be the exact length of the paper.

These directions apply to any forme, but it may be well to recapitulate them as applied to a half-sheet 12mo, as on page 295.

Fold into 12mo ; measure from end of page 7 to beginning of page 6 ; this tests the backs. Open the paper and measure from end of page 7 to end of page 5 ; this tests the gutters. The heads are tested in the same way.

Where the printer prefers to rely on his judgment for the margins, rather than make arithmetical calculations as recommended on pages 294 and 296, margin is made by the aid of this sheet-test alone.

Should any margin-space be found on testing too wide or too narrow, it must be rectified by changing the furniture, or adding or abstracting reglet.

Locking-up.—Having ascertained that the margin-spaces are correct, select and fix the quoins in securely, *plane the forme*, and then with mallet and shooting-stick proceed to *lock-up* finally, so that the forme will lift. If it be in quarters (formed by the cross-bars), each should be *partially* locked-up before any is completely locked-up (except, of course, in the last round), otherwise the cross-bar will be sprung or bent. Let the pressure of the lock-up first take effect from the bottom of the pages. There is more “give,” especially with leaded pages, from the bottom than the sides. The quoin at the thick end of the stick is the one to first operate on, and finish with the quoin at the thin end. In this way the whole will be equally fastened ; but if one part is tightly fastened and another loosely, the pages will bend and become crooked, and a good lock-up—one in which the forme is nearly as solid as though consisting of one piece of metal—will be altogether unattainable.

If mechanical quoins are used the same principles are followed : you tighten by degrees, beginning at the thick ends of the side and foot sticks, and apply the pressure rather more from the foot than the side.

Again plane down the forme, lightly and carefully. This is done, as stated on p. 212, not so much to drive down any outstanding letters (for they ought all to have been sent

into their places by the planing before quoining up) as to neutralise any upward bend, or "spring," of the forme; to this it is especially liable if there are many or large open blank spaces in it.

The next thing to be done is to "see if it will lift;" that is, if it can be raised from the imposing surface without any letters falling out. Tilt the chase, and put a quoin or piece of furniture under one edge, so as to raise the forme a little from the imposing surface; then go over the forme with your fingers, pressing all over the face to find whether there are any "soft" places, that is, places where the type will sink under pressure. Should there be such you should take away the support, let the forme back on to the stone, and find out the cause of the looseness; whatever the cause, whether through furniture binding, a wrong space, or bad spacing, look for it till you find it, and then remedy it, repeating the testing process until the forme is thoroughly secure.

Finally plane the forme down carefully and gently. It is now ready to be sent to the pressman.

Recapitulation.—The following are the processes subsequent to the sliding of the pages on to the imposing stone:—

1. Selecting the chase.
2. Placing the chase round the pages.
3. Making the margin.
4. Putting in the furniture.
5. Putting in side and foot sticks.
6. Untying pages and putting in quoins.
7. Preliminary planing.
8. Final locking-up.
9. Planing.
10. Ascertaining if the forme "lifts."

Some Technical Terms.—In the operations already described the following technical terms are sometimes used:—

The Page Hangs.—When a forme is badly locked-up some of the pages will be found to be bent by the unequal pressure upon some parts of them. They would consequently print crooked. The remedy is to unlock the quarter in which they are imposed, and to pat the face of the type with the fingers of one hand, at the same time pushing up and straightening the page with the other.

In unlocking a forme the first quoins loosened should not be left too slack, or the operation of loosening the others may either squabble the matter or cause it to hang.

Pages too Long and Pages too Short.—Before the quoins are driven up, the compositor should carefully ascertain whether the pages of each quarter are of the same length. The slightest difference will cause them to hang, and prevent a proper locking-up, endangering, in fact, the whole forme when it is lifted.

To test the accuracy of the pages in regard to length, place the ball of each thumb against the centre of the foot-stick, raise it a little with the pressure, and if the ends of both pages rise equally with the stick it is an indication that the forme will properly lock-up. If they do not, the slack page may be tightened by the insertion of a lead, until they both, on being pressed again, rise together.

Furniture Binds.—If the furniture used along with the side or foot sticks is too long, that is, if it is as long or longer than the measure of the page, the side or foot stick will not have its proper pressure upon the type; in fact, the pressure will be exerted on the furniture and not on the page. In such a case the furniture is said to “bind.” The remedy is to change the furniture.

The Forme Rises or Springs (or Bows itself in the Middle).—This is one of the most frequent troubles that arise in locking-up formes of any number of pages. There may be various causes for it, but the principal are undoubtedly “bad spacing” and inattention to blocks being out of

square. Another frequent cause is locking up too tightly ; the quoins or furniture may be imperfect or broken ; the chase may be out of level inside ; there may be too much furniture and quoins, owing to the chase selected being unduly large ; the furniture may have warped, or it or some leads may be binding, or the locking-up may have been improperly done. The remedy is to partly unlock, adjust where wrong, and plane down. When the chase is at fault and a perfect chase cannot be substituted for it, the defect may often be remedied by inserting next to the edge of the chase, and between it and the furniture or quoin, a piece of card-board.

Gauging and Straight-edging Large Formes.—In large formes, in which there is very little margin to the pages, especially when the paper is worked on both sides, the gauging must be so accurately done that the pages must not be out of position even the thickness of a card. The best and really the quickest way—although perhaps not apparently so at first sight—to secure this accuracy is the following : The forme may consist of type, electros, or stereos, or any or all of them combined. Take a piece of brass rule about eight ems long, and place it close between the crossbar of the chase and the furniture, at the foot of the page, long way up. The top will be found higher than the type. Now place a strip of narrow card, long enough to reach from the brass to the bottom outside page, against the brass, and mark on the card the bottom and top of each page in that row. If the furniture is true, and the length of the pages true, all the other lines of pages treated in the same way will fall on the marks as on the first line. If, however, any variation shows itself it must be remedied, and all the lines made to fall alike. In gauging the sides it is best, when there are stereos or electros, to have two pieces of 8-em brass rule to run the gauge at both top and bottom sides of the pages, as previously done at the heads. The reason

for this is, that the plates may not have been planed or mounted squarely. The pages must, as is obvious, be fixed tightly together before the gauging is done.

Another plan, adopted in many houses for all classes of work before going to press, is to use a long steel straight-edge, which is placed against the sides of all pages on each side of the long cross, *i.e.*, in the gutters, then along those in the backs, and so on; after this, the tails in the short cross are tested, and then the heads. The secret of doing this properly is to test every quantum of furniture between the pages and the cross-bar, right down one side. Each of these, which are say $7\frac{1}{2}$ ems, should be placed on end, one against the other, and made exactly true by the addition or otherwise of card or lead. Having got one side both of the long and short cross perfectly true, a certain basis is formed for the other side of the bars and for the backs and heads.

General Instructions.—The following instructions are given by Mr. De Vinne:—

Never impose a forme of more than twelve pages without finding out whether the forme should be in one or more sections. For paper of ordinary thickness, sixteen pages may be put into one section; for very thick paper, the section should be of eight or four pages.

Formes of twenty-four pages in one section should have the back margins of the central eight pages made smaller than the back margins of other pages in the forme.

Always know the exact size of the paper before you begin to make margins.

If the paper is not to be trimmed, make it up to the size in inches by which it is described and sold. Do not make it up to an accidentally-selected sheet, which may be too long or short. If paper is to be wet, find out from the press room or warehouse how much it will probably stretch in wetting, and allow for the increased size.

Find out also whether the proposed form of pamphlet will be cut or uncut as to margins ; whether it will be sewed or stabbed, *i.e.*, side-stitched ; whether it will be bound in a stiff cloth case or in plain paper cover.

If it is to be side-stitched, or bound in a stiff cloth case, allow more margin in the back than you would for a sewed, uncut, and paper-covered pamphlet.

If the pamphlet must be trimmed to a fixed size, be sure to allow enough of blank for what will be cut off.

Always make up margins full, to fill the paper, so that the printed sheet can be truly folded by regularly even folds of the paper. Make sure always that each side margin on the outer edge of the printed sheet is exactly one half of the broad inner margin nearest the cross-bars. Verify this in 16mo formes by folding a sheet of the paper in quarto, and using it as a measure from any point in another quarter. If it does not tally, the margins are not right. Never send a forme to press with unbalanced margins, which will compel the binder to cut off waste before he begins to fold.

When you can do so, put one or more nonpareil reglets in the broad margins and at the tails of the pages. If author or reader chooses to alter the margin a little, the change can often be made by transferring the reglets, without change of quoins or furniture, and with little delay.

The Use of Mechanical Quoins.—As a rule printers still prefer the old wooden quoins, but in some cases mechanical quoins of one kind or another are to be preferred, *e.g.*, where the formes are to be kept standing a long time (for in such case wood quoins are apt to shrink and the forme get loose), where the pages are large and a great deal of power is required ere the forme will lift, and in table work and display work where the justification and make-up have been very accurate. We have already stated that Ward's quoin

requires a very accurate make-up, and it is objected to the Marinoni system that in it the points of application are limited to one or two; while in the Lavater system, though you may put in many quoins, the squeeze that can be given is limited to the extent of the projection on them, which is generally not much.

CHAPTER XXIX.

BOOKWORK (*continued*).—The Selection of Types and Determination of Measure and Margins—Casting-off Copy—Substituting one Type or Measure for another.

IN this chapter we shall deal with subjects which hardly ever concern the journeyman compositor; for, like the plan of a campaign or the order of a battle, they are considered and determined by those in superior authority, and he, like the private soldier, has only to follow the instructions he receives. We refer to the choice of paper and type for a book, and the proportion of the surface of a page to be left for margins. The latter, as we shall see, involves the determination of the measure to which the matter shall be set. These important matters have to be dealt with before any of the "copy" is placed in the hands of the compositor, and a decision upon all points must be come to, if not before the work of the compositor begins, at least before more than a page or two is set.

The size the printed book is desired to be is generally indicated by the author, and the publisher has to consider whether this will be suitable. After calculation, the size has not infrequently to be modified, in order to avoid too great a thickness or thinness of the volume.

The size of the paper being provisionally fixed, the next thing is to determine the size of the type to be used. This depends, first on taste, and next on expediency. If the object be to produce a handsome book regardless of expense, there will be little difficulty about it; but if, as generally

happens, this is not the sole consideration, the canons of taste have to be modified to square with the exigencies of economy.

Obviously, however, the questions of size of type and size of page are to a certain extent correlative. No one would deem a type like minion or nonpareil appropriate to a demy folio or a quarto; while pica in a 32mo would be equally out of place. On the other hand, small type has often to be used on large pages (which are then almost always divided into columns), and large type has sometimes to be used on small pages. Examples of the first kind are to be found in magazines, dictionaries, concordances, gazetteers, and the like; and of the second kind in school books for very young children. But where the matter is not broken up into columns, but reads right across the page, and there are no special reasons for making a change, there are certain canons which should guide one in the selection of the types for a work.

In the first place, a book should never be set solid if it can be avoided. It is far better taste to use a smaller type and lead it, than to adopt a larger type and have it solid.

The following sizes of type seem best to suit the various sizes of pages of paper mentioned:—

Royal 4to	- -	} Great Primer, Pica, Small Pica.
Demy 4to	- -	
Crown 4to	- -	} Pica, Small Pica.
Royal 8vo	- -	
Demy 8vo	- -	
Large Post 8vo	- -	} Small Pica, Long Primer.
Crown 8vo	- -	
Foolscap 8vo	- -	} Long Primer, Bourgeois.
Demy 12mo	- -	
„ 16mo	- -	

Demy 18mo-	-	Bourgeois, Brevier.
„ 24mo-	-	Bourgeois, Brevier, Minion.
„ 32mo-	-	Minion, Nonpareil.
„ 48mo-	-	} Emerald, Nonpareil, Ruby, Pearl.
„ 64mo-	-	

As we have said, exigencies of expediency must always have a controlling influence, and often types different from those indicated have to be used.

Where a large page is divided into two or more columns, the size of the type should be determined by the width of the column rather than by its length.

The size of the type can at first only be chosen provisionally—it may have to be changed for the same reasons as those mentioned in connection with the size of the page.

The next thing is to determine the leading, or space between the lines. Here the rule is that small type should be thinly leaded, and large type thickly. In handsome works and books which are spun out (such as most three-volume novels), the type, provided it be not less than small pica, may be double and even treble leaded.

Then comes the very important question of margins, which necessarily involves also width of measure for the type-page; for, obviously, the size of the paper being fixed, the narrower the measure the greater the margin, and *vice versa*.

Margin.—The determination of the due expanse of margin for a page is a subject of great importance; for upon it depends, to a large extent, the elegance and attractiveness of the book when completed. A book may possess everything that is usually considered as essential to good typography—the type may be new and clear, the paper good and suitable, the composition careful and correct, the press-work irreproachably neat, yet if it has not well-arranged margins it is a failure; the good effect of all the pains taken upon it is lost.

Some books have unusually wide margins, left for certain specific purposes. These are called "large paper" copies, and are very dear (in a double sense) to the bibliophile. These, however, we leave out of our consideration, and confine ourselves to the principles which affect the dimensions of the sizes of pages in ordinary volumes.

As a general rule, solid pages have small margins, and leaded pages larger margins. The width of the margin increases with the width of the space lines, or the doubling or trebling of the leads. The page and the margin occupy something of the relation of the picture and the frame, and there should be a degree of proportion between them. The margin is governed to some extent also by the size of the type. A very narrow margin round a page of nonpareil may not be objectionable, but the same margin round a page of pica would be most disagreeable.

It is not possible, however, to vary margins with every change of type or variation of lead, nor to lay down inflexibly precise rules for the width of the whites of a page. It is sufficient to show how gross improprieties may be avoided, and how the best appearance may be obtained for each special work.

The first rule is that the average margin of a printed page should be equal to one-half of its entire area *when untrimmed* by the binder. This may seem to some an unduly generous amount of "white," but on measurement it will be found the usual proportion, subject to the variations above suggested. When the type is solid it may occupy three-fifths of the page, but when trebly leaded only about one-third.

How is this rule to be applied in practice? We will endeavour to give some directions.

Take a sheet of the paper to be used, fold it carefully until its page is of the size intended for that of the book; then with the foot-rule or type-scale measure that page accu-

rately, setting down on paper the dimensions from top to bottom and across.

Then divide each of these dimensions according to the following directions:—

If the type is to be single leaded, into thirds;
 " " solid, into fourths;
 " " wide leaded, into twelfths;

and assign to type-page and margins the following proportions:—

If type single leaded - - Type $\frac{2}{3}$, margins $\frac{1}{3}$.
 If type solid - - - - Type $\frac{3}{4}$, margins $\frac{1}{4}$.
 If type wide leaded - - Type $\frac{7}{12}$, margins $\frac{5}{12}$.

An arithmetical calculation will show how long and how wide in inches or pica ems the page of type will be.

As to the space left for the margins, these have to be divided between the head and the tail and the back and the fore edge respectively in such a manner that the tail shall have half as much again as the head and the fore edge half as much again as the back. This necessitates dividing the margin space into fifths, thus:—

Head - - two-fifths Tail - - three-fifths
 of the total vertical margin space.

Back - - two-fifths Fore edge- three-fifths
 of the total horizontal margin space.

Let us see how this works out in a specific instance. Let us assume that the book in question is to be a demy octavo set in small pica single leaded.

A page of demy 8vo measures $8\frac{3}{4}$ inches in height and $5\frac{5}{8}$ inches in width, or in pica ems, $52\frac{1}{2}$ by $33\frac{2}{3}$. Dividing each dimension by 3, and appropriating $\frac{2}{3}$ to type and $\frac{1}{3}$ to margins, we get type space 35 ems by $22\frac{1}{2}$ ems. Aggregate margin spaces, $17\frac{1}{2}$ ems by a little less than $11\frac{1}{4}$ ems. Thus our page of type should measure 35 ems pica long and $22\frac{1}{2}$ ems wide.

We have now to apportion the margin spaces. We divide the $17\frac{1}{2}$ ems by 5 and give $\frac{3}{5}$, or 7 ems, to the head, and $\frac{3}{5}$, or $10\frac{1}{2}$ ems, to the tail. Similarly, we divide the $11\frac{1}{4}$ ems by 5 and give $\frac{2}{5}$, or about $4\frac{1}{2}$ ems, to the back, and $\frac{3}{5}$, or about $6\frac{3}{4}$ ems, to the fore edge.

To see how such a page with such margins will look, cut a piece of paper, preferably coloured, to the size of the type-page (35 by $22\frac{1}{2}$ ems pica) and place it on a page of demy octavo in such a position that the margin at the fore edge is half as much again as that at the back, and that at the tail half as much again as that at the head.

A good idea is now obtained of what the appearance of the printed page of the book will be. Should the length or width of the page of type appear too small or too large for the work required, it may be enlarged or diminished to taste.

A still better idea of the appearance of the page will be gained if, the coloured paper having been duly adjusted upon the plain, the position of it is denoted by dots made by a pencil at each corner, and then in the space so marked out lines are ruled corresponding to lines of type. Frequently a page of the type agreed upon is set to the fixed measure and made up to the proper depth, and a proof submitted pulled in proper position on its own paper.

If the reader will, by way of exercise, pursue the method above described with reference to the present work, he will see how far the page of our print actually coincides with that calculated under the rule before given. We have only to state that the paper used is Large Post, and that the octavo page of it, untrimmed, measures $8\frac{1}{4}$ by $5\frac{1}{4}$. The book as the reader now sees it has, of course, been trimmed by the binder.

Certain standard measures for ordinary bookwork have been fixed according to the size of the page of paper to be used. They are not necessarily the best for the work the printer may have in hand, but they will always serve as

a guide. We annex a table of them. The end columns show the aggregate of the whites available for the margins at the top and bottom and sides of each page.

It is a good plan for a book printer to have on shelves in his office copies of works of various styles and sizes, executed by printers of repute, and to refer to them as precedents. His good taste will determine whether these are capable of improvement or not.

STANDARDS FOR BOOKWORK.¹

		Page of Paper measures in Pica ems.		Page of Type should measure in Pica ems.		Left for Margins (Pica ems.)	
		Width.	Length.	Width.	Length.	Sides.	Head & Tail.
FOOLSCAP—							
4to -	-	- 40½	51 -	- 27	34 -	- 13½	17
8vo -	-	- 25½	40½ -	- 17	27 -	- 8½	13½
12mo -	-	- 20	34½ -	- 14	23 -	- 6	11½
16mo -	-	- 20	25½ -	- 14	17 -	- 6	8½
CROWN—							
4to -	-	- 45	60 -	- 30	40 -	- 15	20
8vo -	-	- 30	45 -	- 20	30 -	- 10	15
12mo -	-	- 22½	39 -	- 15	26 -	- 7½	13
16mo -	-	- 22½	30 -	- 15	20 -	- 7½	10
LARGE POST—							
4to -	-	- 49	63 -	- 33	42 -	- 16	21
8vo -	-	- 31½	49 -	- 21	33 -	- 10½	16
12mo -	-	- 24½	42 -	- 16½	28 -	- 8	14
16mo -	-	- 24½	31½ -	- 16½	21 -	- 8	10½
DEMY—							
4to -	-	- 52½	67½ -	- 35	45 -	- 17½	22½
8vo -	-	- 33½	52½ -	- 22½	35 -	- 11	17½
12mo -	-	- 26	45 -	- 17½	30 -	- 8½	15
16mo -	-	- 26	33½ -	- 17½	22½ -	- 8½	11
32mo -	-	- 16½	26 -	- 11½	17½ -	- 5	8½
ROYAL—							
4to -	-	- 60	75 -	- 40	50 -	- 20	25
8vo -	-	- 37½	60 -	- 25	40 -	- 12½	20
12mo -	-	- 30	49½ -	- 20	33½ -	- 10	16
16mo -	-	- 30	37½ -	- 20	25 -	- 10	12½
32mo -	-	- 18½	30 -	- 12½	20 -	- 6	10

¹This table has been calculated on the assumption that in each case the matter is leaded, and full margins are allowed for. Therefore the size of the page of type may, in solid or in common work, often be increased.

The printer (or publisher) has now fixed provisionally the size of the paper, the size of the type, space between the lines, and the widths of the margins. His next task is to estimate the number of pages the work will make if printed in this manner. To do this he must "cast off" the copy as directed in a subsequent part of this chapter. Having done so, it remains to be seen whether this number of pages will be too many or too few to make the volume of the desired thickness. If it makes too many, the type may have to be changed for a smaller one, or the margins lessened by increasing the length and width of the page of type, or the leads may have to be sacrificed or the thickness of the paper diminished; changes may, perhaps, have to be made in all these respects. Similar, but converse, alterations will be necessary if, on calculation, the book appears too thin.

Clearly, then, a great many things have to be considered before the sizes of type and paper, the measure of the page of type, and the extent of the margins can be finally determined. Commercial considerations often step in and sadly upset all rule and all considerations of beauty. Take as an instance Green's *History of the English People*, published by Macmillan & Co. The library edition is in three volumes, demy octavo, printed in pica, leaded, with unexceptionable margins. The *Short History* in octavo was required to be in one volume, capable of being offered at a popular price; the type might not be too small, or many would cavil at it; but the length of the work was such that, printed in the ordinary style, even on thin paper, it would make a thick book. The result was that the size of the type-page had to be made unduly large, and the margins unduly small. The book is admirable from a literary point of view; but its "get up" is a perpetual eyesore to a printer or a lover of good printing.¹

¹ On the other hand, the illustrated edition (printed by Messrs. R. Clay & Sons) is a beautiful specimen of bookwork, the type being bold and the margins large.

The sheet that contains the pattern of the leaf and of the page determined upon should be preserved, as it may come in useful for *making margin in the chase*.

As it would be too tedious a process to make a diagram of every page, take a sharp penknife, and on the ruled lines make occasional stabs (two on a line are sufficient) through the folded paper. There will be marked on every leaf the size of the page and its proper position. Then unfold the sheet, and the width between the stabs will determine with the greatest accuracy the proper width of furniture for every side of the page.

The distance between the stabs at the head and the foot of the page (allowing one line more for the foot white-line) will show the length of the furniture for the back margin; the distance between these stabs the proper width of that furniture. The length and width of the heads can be determined in the same manner. It is possible by this method not only to determine the width and length of the furniture for the head and back margins, but to cut the furniture before the pages are laid on the stone, and with a degree of accuracy that is scarcely possible with any other method.

The width of the furniture for some of the margins, it will be remembered, can be calculated only after ascertaining the exact width of the cross-bars in the chase. Deduct the width of these bars from the space between the stabs; divide the remainder into two parts, and the proper width for the furniture next the bars will be known.

Most pamphlets are made up to the regular folds of regular sizes of paper, and the binders have pattern boards to ensure uniformity of size in their work. The printer, availing himself of this uniformity, should have a 4to, 8vo, 12mo, 16mo, and 18mo pattern for such papers as he uses. These papers and folds will give a variety of sizes equal to all ordinary requirements. It is advisable to first consult the binder, and get a series of patterns cut out

of millboard, each of which shall truly represent the largest size to which the leaf can be cut in the practical work of trimming.

These patterns should be appropriately marked and carefully preserved. In making up, lay the board over two connecting pages (for instance, in an octavo forme over pages 1 and 16), and put as wide furniture between them as will allow the edges of the pattern to touch the edges of the pages of type. The space between indicates with precision what should be the true back margin for all ordinary centre-stitched pamphlets and plainly sewed and bound books.

The pattern board is also useful in determining the proper size of a page of type in making up. When rule borders are used on pages, it is indispensable. On all odd and irregular sizes of paper the making of this pattern should precede all other work—even that of setting the type.

Casting off Copy.¹—This is the process of estimating the number of lines or pages of type a given piece of copy will make. It is often a very troublesome thing, especially when the copy is MS. unevenly written and much corrected, in which case the result of the calculations is not likely to be closely accurate, unless the actual number of words in it be counted, which is seldom or never done.

The best way is to count or estimate the number of lines of the MS., and then to set up from an average part of it a number of lines, stopping where the end of a line of type coincides with the end of a line of the MS., and then work out a proportion sum.

Example 1.—We will assume that eight lines of the MS. make five of type, and that there are 4000 lines of MS. in

¹ “Casting off” must not be confounded with “casting up,” which (as will be seen hereafter) is the reckoning of the number of thousands of “ens” in a given quantity of composed matter, and their money value.

the copy. Then $8 : 5 :: 4,000 : x$ (the answer required); and by working this sum out we find the answer to be 2,500, *i.e.*, the copy will make 2,500 lines of type.

If we know the average number of lines to the page of type we can at once calculate the number of pages the copy will make. Suppose there are 40 lines to the page, then the 2,500 lines will make $2,500 \div 40$, *viz.*, $62\frac{1}{2}$, *i.e.*, 63 pp.

Another way, in which the trial setting is avoided, is shown by the following example:—

Example 2.—Copy consists of 200 sides of MS., each side containing 20 lines, and each full line containing on an average 9 words. It is to be set in small pica type, 22 ems (pica) wide, and there are to be 33 lines of reading matter in each page of type.¹ How many pages will it make?

The total number of words in a page of the MS. is 9×20 , = 180; therefore in the 200 sides there are 36,000 words. Now, the average word in the English language occupies 6 ems, but one must be added in each instance for a space, which makes 7 ems; therefore these 36,000 words will occupy 252,000 ems. Now, by the table on page 70 we find that 72 ems pica and 83 ems small pica go to a foot; therefore the measure of 22 ems pica will equal (nearly) $25\frac{1}{2}$ ems small pica ($22 \times 83 \div 72$); and these are equal to 51 ems small pica. We now have a total of 252,000 ems, and 51 ems to the line; therefore the number of lines will be $252,000 \div 51 = 4,941$ lines; and as there are to be 33 lines of type to the page, the number of pages the MS. will make will be $4,941 \div 33$, or 150 pp. *Answer.*

If the matter is divided into chapters, we must make an allowance of, say, half a page for a white at the head and end of each. Say there are 8 chapters; the allowance will be $\frac{1}{2} \times 8 = 4$ pages. Therefore the total number of pages will be 154.

¹ It is necessary to specify "reading matter" to show that head or folio lines and whites are not included.

It will be observed that no allowance has been made for short lines at the ends of paragraphs. The reason is that the short lines of print may be set off against the short lines of MS., and so no account of them need be taken. If, however, we have the number of *words* in the MS. counted, and base our calculations upon them, an allowance of about 5 per cent. on the number of pages must be made for these shorts, *i.e.*, they will be increased by $\frac{1}{20}$.

Example 3.—A MS. consists of 4 chapters, and contains 45,000 words, each word averaging 6 letters. How many pages will it make in long primer, the width of the page of type to be 20 ems (pica), and the number of lines of reading matter on a full page to be 40?

Multiply 45,000 by 6, this gives the number of ens (270,000); add 45,000 for spaces (total ens, 315,000). Then (by table on p. 70) 20 ems pica = 25 ems long primer ($20 \times 90 \div 72$), and these = 50 ens long primer. Divide 315,000 by 50, and you get the number of lines (6,300). Divide these by 40, and you get the number of pages without allowances (158); add for short lines in paragraphs $\frac{1}{20}$ of 158 = 8 pp., and for the 4 chapters (2 pp.), and you arrive at 168 pp. *Answer.*

Of course all these results are only approximate; they are, nevertheless, of the greatest use.

Should the work be illustrated, the dimensions of the blocks must be ascertained and allowed for.

Substituting one Type or Measure for Another.—If it be desired to know what number of pages the work will make if set in a different type, a fresh calculation, according to the preceding rules, must be made, or one similar to that on page 72, by the aid of the table on page 70. So, too, if the measure is to be altered, we can arrive at the result by multiplying the existing (or given) number of pages by the old measure and dividing by the new. In each case it is a matter of proportion. See Example No. 2, on page 71.

CHAPTER XXX.

BOOKWORK (*continued*).—Title Pages—the Old or Monumental Style
—Various Modern Styles.

THE Title Page of a book, always an essential part, is by the compositor deemed by far the most important page he has to set—and rightly so, because it affords him the greatest scope for a display of his artistic taste and feeling. It must be bold and yet neat; it must display at once the message it has to deliver to the reader. Yet no part of it must obtrude upon him, and the whole must be symmetrical. The compositor has, indeed, few more difficult tasks than to produce a perfect title page.

Formerly, there was practically but one style for title pages, and though this survives, and is indeed even now the most prevalent, especially for the more serious and valuable books, it is by no means universal, and at the present time there are almost as many styles for title pages as there are for announcements. We will draw attention to a few.

The Monumental Style.—This is the old, orthodox style for title pages, and it is so designated because it consists of straight lines of capital letters of varying lengths across the page, like the inscriptions to be found on monuments. In this style the page may be divided into three portions—the upper or initial portion, which gives the title; the medial, which includes the name of the author, the edition, and the volume; and the final or lowest, which gives the place of

publication, the name of the publisher, and the date. In by-gone days the title page was made to give quite a summary of the contents of the book, but this is now considered improper; and indeed, within limits, the more white there is in the page, and the better balanced it is, the more successful is the result. Hence, the author should co-operate with the printer to produce a good effect, and should not require the insertion of lines which will spoil it. When these can be dispensed with, and seeing that the title page is, *par excellence*, the printer's page of a book, he may, without outstepping his province, suggest to the author what it should and should not contain, if the copy supplied for it appears to warrant this interference. The setting should, as a rule, be in caps. or titling letters throughout, and although a line of black letter may sometimes be admitted, fancy types are to be rigidly excluded. Occasionally we find in titles emanating from good book houses a word or two of sanserif or a line of italic; but on the whole these too should be avoided, and due effect should be obtained by a selection of various sizes of plain Roman capitals and nothing else. And these should not vary in form more than is absolutely necessary; in other words, they should as far as possible be of the same style and the same series. Of course, the fullest and most prominent line is that which contains the title, or the main title, of the work, and the next boldest line is that which gives the name of the author. With regard to the length of the lines, it has been said that a well-displayed title page should follow the outline of a well-shaped vase, the longest line being equivalent to the rim, the part which denotes the volume being in the place of the stem, while the publisher's name and the date constitute the base. The analogy is good generally, but it must not be followed too slavishly. Whether there should be points of punctuation or not is a moot question; one school puts them in, another leaves them out. On the whole, we

incline to think they are best left out, mainly because they sometimes disturb the balance of the lines.

As a general rule, the style of the body of the work determines the style of the title; yet it is not always so, and a work set in modern style type has sometimes a title page in old style. This is especially the case in France, and it must be conceded that the French printers are adepts in setting title pages. As previously stated, the Gallic Old Style type lends itself especially to the display of title pages.

Modified Monumental Style.—We use this term to designate the title pages which, though set in straight lines of varying length, are wholly or in part in lower case with cap. initials. This is often a most effective style and is seen to advantage in some of the books issued by what may be termed the Art publishers. When lower-case letters are chosen they should be heavy and bold, like the old face Caslon types, the main line of the page being in anything from a two-line pica to canon, or even larger. De Vinne type is often used in this style of setting, but we prefer the plain old style if it be only strong in face.

The Inverted Pyramid Style.—This style is adopted more in booklets for the dilettanti than in solid literary works. Its name fully explains its character, and when tastefully set it is decidedly effective. As a rule, faces used in it should be confined to such types as the Gallic Old Style capitals. As an illustration we give a photographic reproduction of a page emanating from the Chiswick Press; the original measures $6\frac{1}{2}$ by $3\frac{3}{4}$ inches, and in it the first full line and the word "London" are in red.

The "Memorial Brass" Style.—This style affects the appearance of the lettering on memorial brasses, that is, it usually runs on from beginning to end without break, the words sometimes being divided by full points or by florets. Old style caps. are used, but black letter of an old and

72nd Second Edition *Chenamb*

Dictionary for the Pocket

French and English

English and French

Both Divisions on same Page

By John Bellows.

Masculine and Feminine words

shown by Distinguishing Types

Conjugations of all the Verbs

Liaison marked in French Part

and Hints to aid Pronunciation

Together with Tables & Maps

Revised by Alexandre Beljane

Professeur-Adjoint de Faculté des Lettres de Paris

Maître de Conférences à l'École Normale Supérieure

écrits trad. by John Sibree Esq. & J. Malet, Esq.

London: Tegan-Paul, Trench, Trubner & Co.

Patronage: House of Commons, House of Lords

Paris: Librairie: Hachette, et Cie.

New York: Henry Holt & Co.

MEMORIAL BRASS STYLE.

THE
PRINTING OF MODERN BOOKS
BEING A PAPER READ BEFORE THE BIB-
LIOGRAPHICAL SOCIETY ON JUNE XIX
MDCCCXCIII, BY CHAS. T. JACOBI
A MEMBER OF THAT SOCIETY
MANAGER OF THE CHISWICK
PRESS: IMPRINTED BY
THE AUTHOR FOR
PRESENTATION
ONLY



LONDON
MDCCCXCIII

INVERTED PYRAMID STYLE.

regular form, such as Stephenson's Anglo-Saxon, is generally selected. The title page to Bellows' French Dictionary is in this style, the lines being divided by red rules. It has an excellent effect when well set, but is better suited for small books than octavos, though quartos and folios may be treated in this manner with handsome, bold types. It is commonly chosen when the wording of the title page is long.

The Grouped Style.—Many title pages are now set according to the distinguishing features of modern display composition. That is to say, certain phrases are set to measures far short of the full width of the page and placed in groups, some near the top left-hand corner, some near the right-hand, in the middle, and so forth. This style of composition is dealt with more at length in the chapters on Jobbing Work, to which it chiefly belongs. In bookwork it is mainly confined to artistic booklets, though occasionally serious works have their title pages thus set. For instance, the titles of the demy octavo volumes of the *Cambridge Natural History*, published by Macmillan & Co., are so set. It is often very effective, especially if the page be printed in red and black. Bold Old Style, Gallic Old Style, Jenson, De Vinne, and Old Style Antiques best suit this kind of composition, and as a rule lower-case letters are to be preferred. In titles so arranged a little conventional ornament is sometimes allowed, but it must be very sparingly used, and must be inserted with taste and discretion, or it will spoil them. Sometimes a very effective page is produced by putting the title of the book in single-word lines set in lower case to two-fifths of the measure of the page on the left hand of the upper fourth, and the name of the author and his qualifications on a level with it on the right hand, the centre of the page being reserved for the statement as to the illustrations, etc.

Bordered Title Pages.—These are not so fashionable as

they were a few years ago. They consist sometimes of rules, single, double, or treble, worked in red, or in black and red, but more often of conventional borders, either open or heavy, like the German "Florentine" border. When these are used, care must be taken that they do not overpower the page, and the lettering within them should rarely or never be grouped.

In the composition of title pages the greatest effect is produced by means of careful spacing. The selection and arrangement of type may be excellent, but bad spacing will assuredly spoil the page. A few suggestions may be made, but in this, as in all display work, the greatest taste and judgment on the part of the compositor need to be exercised. Presuming the title in hand has but three main portions, a fourth is sometimes added by way of a rule or ornament, or a publisher's seal or device, inserted between the author's name and the imprint. In whiting out the sections some experts will equalise the space, but we prefer and maintain that a little *less* white should be put between the first and second sections, because the author's name is strictly dependent upon the title line or lines; and that a little *more* white should be given between the rule and the imprint. To illustrate this numerically: if we had 15 ems white to insert between the sections, four ems should be placed between the first and second, five ems between the second and rule, and six ems between the rule and lower section. To the eye this title would be equally balanced. Of course, the catch line "By" above the author's name would count *in* the white, as would the word "London" or "Edinburgh" if it occurred alone, as it sometimes does, above the publisher's name. In place of the rule or seal the words "Second Edition," or "In Two Vols.—Vol. II." (each with a short brass rule above and below them), or what not, may be inserted, but the spacing remains the same relatively.

CHAPTER XXXI.

BOOKWORK, MISCELLANEOUS.—Titles, Prefaces, etc.—Indexes—Head Lines—Notes—Figures—Woodcuts—Head and Tail Pieces—Initial Letters.

AN examination of an ordinary book—this one for instance—will reveal the fact that in addition to the text or body of the work and the title page there are various other parts, of which some precede the text, some follow it, others consist of notes, either at the feet or sides of the pages of text, and others again of poetry or extracts within the text.

Preliminary Matter.—The whole or part of the first sheet of a book comprises what is called the “preliminary” matter. It consists of all or some of the following, and generally in the order here set out:—

- | | |
|-------------------|---------------------------|
| 1. Half-title. | 6. Preface. |
| 2. Title. | 7. Contents. |
| 3. Imprint. | 8. List of Illustrations. |
| 4. Advertisement. | 9. Introduction. |
| 5. Dedication. | 10. Errata. |

After the last-named comes the text matter, and after it the appendices and index.¹

¹ When the arrangement of the portions comprising the title-sheet are unusually complex, bear in mind the principle which underlies the whole. All the matter not directly connected with the text should precede the contents—as, for instance, the preface and advertisement. Everything included in the contents page should follow the contents, of course. An editor's preface should precede everything edited, and should be set in type slightly larger than the rest of the book.

The Half-title is usual in the best books, but is not an absolute necessity. It saves the title page from too abrupt an appearance. It is, in fact, a short title of the work, and it consists of one line, or, at the most, of two or three lines only, and it is generally set in type about half the size of the leading line in the title. The style is the essence of plainness—generally ordinary titling caps., but sometimes a bold lower-case letter is used, especially when the title is in lower case; but, anyhow, there must be no rules or ornaments of any kind. Black or ornamental letter is out of place. The half-title is usually set so as to print just above the middle of the page, though occasionally it is grouped at the left top corner.

The Title Page.—This has already been dealt with.

The Imprint.—This usually appears at the back of the title page, though it is sometimes placed at the back of the half-title or at the extreme end of the book. When it comes there it constitutes one line in small caps. at or near the bottom of the page, and it has a thin brass rule just above it. When it comes after the title or half-title it is generally set in two or three lines, thus:—

LONDON :
SPOTTISWOODE & CO.,
NEW STREET SQUARE.

It is generally all in small caps. of a small body. It may appear in the centre of the page or near the bottom. Occasionally the name of the place is set in a small black letter. Some printers, *e.g.*, Cassell & Co., have a small woodcut or device to serve for an imprint.

The Advertisement.—What is called the advertisement is generally a short note by the publisher referring to the circumstances under which the book or edition is brought out; it is usually placed next after the title, and is set in type either of the same body as that of the text of the work or of a

body one or two removes larger. Circumstances, however, often arise to interfere with these requirements. Much depends upon the nature of the work and the length of the advertisement. An editor's preface (or advertisement) generally precedes the author's preface, in the larger type of the two. When it does not occupy a full page it is placed in the middle, but so that there is slightly less white at the top than at the bottom.

Dedications are less in vogue now than formerly. They usually consist only of one page, and are displayed, something in monumental fashion, in lines as written by the author. The types used are capital or small capital letters; sometimes a mixture of both is used, but small caps. are preferable. Very large letters should not be used, and the general appearance of the page should be as neat as possible. The line in the largest type is the name of the person to whom the work is dedicated; the name of the dedicator or author is set in caps. of its own. The word "dedicated" is sometimes set in black letter. If the dedication should happen to exceed a page (which is rare), it may be set up in type a size or two larger than that of the text.

Prefaces and *Introductions* are usually in the same letter as the text. The preface may have an extra lead through it, and it may be set in type one size larger than the text.

The word "Preface" or "Introduction" is generally placed at the beginning of the matter. It is usual to set it in the same type as that of the chapter headings. It used to be customary to set the preface in italic, and this old custom is sometimes followed, though it is now more common to find it discarded.

In folioing or paging preliminary matter, Roman numerals are used, generally lower-case letters. The half-title or title, or the first page, whatever it may be, is reckoned as i, and the blanks are also counted. The first page of each section of preliminary matter always begins on an *odd* page; it

has no folio, the turnover pages only taking the folios, together with the word "Preface" or "Introduction," as the case may be. Sometimes the folios are placed in the centre of the line instead of at the beginning or end.

Contents are set in type one or more sizes smaller than the body of the work. They may be set to the full measure (which is the usual plan) or in two or more columns.

When the statement of the contents of each chapter makes but one or, at most, two lines, it is usual to set the whole in caps. and small caps., prefixing the number of the chapter in Roman numerals. When it runs to more than two lines it is usual to set the whole contents in lower case. Whenever the summary clause exceeds one line, the following lines should be indented. The figures indicating the pages are usually set full out to the end of the measure, and the wording never runs further than to within 2 or $2\frac{1}{2}$ ems of the end of the line, unless the transgression of this rule will get the whole of a clause into one line, when it is usually permitted. The following gives a good idea how a Table of Contents is ordinarily set. Observe how the Roman numerals range :—

CHAP.	PAGE
XXXVIII. OBSERVATIONS ON THE FRAME OF NATIONAL GOVERNMENT - - - - -	261
XXXIX. OBSERVATIONS ON LOCAL GOVERNMENT - - -	285
XL. THE GOVERNMENT OF CITIES - - - - -	307

When the Table of Contents is very full, and the page is given for each topic (as in the Library Edition of Macaulay's *History of England*), the Chapter is set in caps. and centred, and the contents thereof are set in lower case, thus :—

CHAPTER I.		PAGE
INTRODUCTION - - - - -		1
Britain under the Romans - - - - -		4
Britain under the Saxons - - - - -		5
Effect of the Conversion of the Anglo-Saxons to Christianity - - - - -		6

Such a Table of Contents, if very long, is sometimes set in double columns. The Contents to the present volume illustrate another very common style.

Lists of Plates or Illustrations are set like Contents.

Errata are best placed immediately before the commencement of the text. Sometimes it is more convenient, however, to insert them at the end of it. They are set in type two or three removes less than the body of the work.

Sub-titles.—Where books are made up of two or three works, or of different kinds of work by the same author, sub-titles are common. They always occupy a right-hand page, and have a blank page following them; and they are set just like half-titles.

Appendices are usually set in type one or two removes smaller than the text, and they are either solid or more thinly leaded than the text.

Indexes are usually set in type two or more removes less than the body of the work, when practicable. The compositor must notice that they always begin on a right-hand page, and are always placed at the end of the volume.

Sometimes the index is not folioed continuously with the rest of the work, but that plan is objectionable. The word "Index" forms the head line. Over the various references and folios should be placed the word "Page" or "Paragraph," etc., as the case may be, and this should be repeated in the heading of each successive page over which the index extends. There may be one, two, or more columns. The initial letter of each class, as A, B, C, may be inserted, in which case it should be centred.

In setting the points to carry the eye from the end of the last word to the figure in each line, several styles may be adopted. Leaders may be used, as—

Bookwork miscellanies..... 32

Full-points divided by em quads may be used also. In the

latter case they may be so arranged as to form a vertical line down the page, thus:—

Bookwork miscellanies	32
Bye-laws and regulations	68

They may, however, be arranged in the style following, which, indeed, is that most usually adopted:—

Bastard founts	21
Bookwork miscellanies	32
Bye-laws and regulations	68

This plan has its disadvantages, as a line deleted involves a rearrangement of succeeding lines.

When the whole of a reference cannot be got into a line, it must be turned over and the indentation made at the second line; that is to say, the lines are to be set “run out and indented,” but the running out of the word is never to the end of the measure, but stops short at a distance of two or more ems from it.

Head Lines.—There are several kinds of Head Lines. “Running Heads” state the short title of the work, and are repeated on every page; another common system is to give on every left-hand page the short title of the work, and on every right-hand page a word or two indicative of the matters dealt with on that page; a third is to head the left-hand pages with the general subject-matter of the chapter, and vary the right-hand pages according to the contents thereof; a fourth, to let the heading of each page indicate its contents. The author, publisher, or overseer usually arranges the style of the headings in a book, and in this respect nothing is left to the compositor. The latter, however, is called upon to see that, in whatever style composed, all the headings throughout the work are alike. Inattention to this rule will invariably be followed by complete loss of character for the good workmanship of the book. Further, all the head lines should be “whited out” alike; that is,

should have the same blank space after them. This rule, however, may in certain emergencies be slightly departed from; but the greater the departure the more the work suffers in good looks.

Head lines should be spaced a little wider than the body of the work, on account of the white space before and after them. The amount of spacing will depend upon the size of the letter and the degree of solidity of the page generally.

The small capitals of the letter in which the book is set were formerly almost exclusively used for the head lines; but there is now more elasticity, and the capitals of the same fount, or italic capitals of a fount one or two removes smaller, are now much used. Books printed to imitate the old style frequently have their head lines in italic lower case. In such cases care must be taken with the capitalising, which must be uniform throughout the volume.

Sometimes the head lines are in old style italic, although the text is in modern faced type. Occasionally a single brass rule divides the head line from the text, but this is not usual.

Some authors and publishers like the number of the chapter to be stated in the heading; when this is done it is common to end the heading of a left-hand page with the contraction for "Chapter" preceded by a bracket, thus—[CHAP., and to begin the heading of the following right-hand page with the number of the chapter in Roman numerals followed by a bracket, thus—VIII.]. If both Part and Chapter are stated, the Part is given at the end of the left-hand heading, thus—[PT. III., and the chapter given at the beginning of the right-hand heading, thus—CH. XXII.]. Sometimes, as in historical works, the years dealt with in the chapter are inserted—[1709-1715.

When a new chapter commences a page, the head line is usually omitted from that page.

When a work is divided into "Books," "Parts," and

"Chapters," the commencement of a new "Book" or "Part" is generally headed thus: "Book II., Part I., Chapter I." in three lines, the sizes of the type being graduated, making the Book the largest, the Part less, and the Chapter still less.

Folios.—The folios are nearly always inserted in the head lines, at the beginning of them on left-hand pages and at the end of them on right-hand pages, as in this work. Sometimes, however, where there is no head line they are placed at the top of the page in the centre, and occasionally they are placed at the foot of a page. When a new chapter begins a page it is usual to omit the folio on that page; but some printers put it in small figures in the centre of the white line at the bottom.

White Lines.—Whenever white lines are necessary, they should be set up in quads. The use of leads or clumps for this purpose is not to be recommended. They should be uniform throughout a book, in similar places. White lines after headings are usually the same body or depth as that of the letter that the text is set in. If that, for instance, be long primer, the white line will consist of a line of long primer quads. In this way the folios and head lines in a book are made to "register," and all the pages of text to back each other.

Notes.—There are several kinds of notes, and they receive their names from their relative position to the other matter in a page, *e.g.*, shoulder, foot, side or marginal, cut-in or in-let, and under runners.

Foot Notes (also called *bottom notes*) are placed at the bottom of a page. They are usually set in type three, or at least two, sizes less than that of the body of the page, and if that is leaded a thinner lead is used for notes. Of course, if the body of the type used for the text is small, the note may have to be in the same type; but this is to be avoided when possible.

If there is but one foot note to a page, and it is very short, it is usually centred; if there are two very short, both are put in the same line, the first being set at or near the beginning of the measure, and the second driven out to or near the end of the line, a white space being left between the two notes. Sometimes the plans are combined thus:—

¹ Twiss's *Life of Eldon*, i., 446; Rose's *Corr.*, ii., 118.

² Rose's *Corr.*, 119.

³ *Ibid.*, 141.

⁴ *Ibid.*, 153.

Foot notes are sometimes set in double columns, although the text comes across the page. In many books a full rule is placed before the first note, to divide it from the text. This, however, is not often done now, a white space line being considered sufficient. The difference in type is enough to show where the text leaves off and the note begins; but whenever the same type, or nearly the same type, is used for both text and notes, the full rule should be inserted.

The whites before notes should be uniform throughout the work whenever possible, but the exigencies of the make-up sometimes prevent this.

Not unfrequently that portion of the text to which a note refers occurs so low on the page as to render it impossible for the whole of the note to appear. Consequently the remaining portion is turned over on to the next page, where it takes precedence of other notes.

Notes upon notes follow the same rule as notes upon the text, and are set in type at least one size smaller.

There are various ways of referring to notes in the text. One is to use the reference marks shown on p. 47 in due order; this is now comparatively seldom adopted and is thought old-fashioned; another is to use italic lower-case letters of the alphabet in due sequence enclosed in parentheses: this course is common in law books; a third is to use figures enclosed in parentheses; a fourth is to use

SHOULDER
NOTES.

superior letters as shown on p. 54; and a fifth is to use superior figures: this last is now the most usual. When letters of the alphabet or numbers are used, they may commence with *a* or ¹ at the beginning of each chapter, and proceed regularly throughout it; or they may commence with *a* or ¹ on every page, which is the more common way. Whichever method is adopted it must be adhered to throughout the work, and obviously the note referred to must be designated by the mark, letter, or number, whatever it is, used in the text.

When setting matter with foot notes it is usual to insert the note immediately after the line to which it relates, so that there may be no mistake as to the relation when the matter has to be made up into pages. It is usual, if superior numbers commencing with ¹ on each page are used, to set ¹ each time a note occurs unless two or more notes follow closely, when ², ³, are inserted, returning to ¹ again after a run without notes. Of course the figures may have to be altered when the matter is made up.

Shoulder Notes are those which are placed in the margin at the top of a page, commencing on a level with the first line of the text. They are usually confined to a statement of the chapter or section of the work, but in histories the dates may be inserted as shoulder notes. An instance of a shoulder note is given on this page. They generally consist of a repetition of the book, chapter, etc. Sometimes they are preceded by a bracket in the even pages, and followed by one in the odd pages. This, however, is a matter that will not be decided by the compositor, who will only be required to follow the style specified.

Side or
Marginal
Notes.

Side Notes or *Marginal Notes* stand at the outer margins of pages; that is, on the left-hand side of left-hand (or even) pages, and the right-hand side of right-hand (or odd) pages. They usually contain either the authority for statements against which they are placed, or a summary of the

contents of some quantity of matter. If the measure in which side notes are set is very narrow, the lines of words may be of varying lengths and need not be justified to the end of the measure. If this were done, very wide spacing would be necessary, or awkward divisions would have to be resorted to. The average measure is 4 ems pica. When side notes are used, the width of the text being reduced one or two ems from what it otherwise would have been, the margin between the text and the fore edges of the paper should be larger than usual to allow of their insertion. They are set up by themselves to the measure required and to the same depth as the page (the whites being formed with quads or quotations), and the column is then added to the page of text, a lead being placed between the two to give the necessary white.

The principal point to be noticed in setting side notes is to get them in such a position that they begin just opposite where the matter to which they refer is placed. Some little trouble will occasionally be necessary to do this, but it is well worth it. They are of course composed independently of the text, and arranged afterwards.

Sometimes, but very seldom, books have side notes on both margins of the page. The same rules apply to those on either side.

Under Runners are continuations of side notes. When a side note is too long for all of it to be placed at the side of the text to which it refers, the text may be divided, and part of the note let into it. This is also done to prevent a long side note displacing another. Under runners, however, are very unsightly, and should be avoided whenever possible.

In order to avoid confusion, these notes must never be set out to the full length of the measure of the text. They should begin or end, as the case may be, three or four ems from the line.

Cut-in Notes, or *Let-in Notes*, are, as the name indicates, let into the text. A rectangular place is made for them by a certain number of lines of text being shortened.

These notes should always have the same white at the beginning, side, and end. They should never, in any part of them, come close to the text, or they will destroy the appearance of the page and cause the reader to be confused.

They are always placed on the outer margin, whether of an odd or an even page. The type used should be two or three removes from that of the text. A small thin-faced clarendon or old style antique is sometimes used with good effect. The words are never justified out to the end of the measure, but are left with the right-hand side uneven, and this whether the note is a left-hand or a right-hand one. Here are specimens :—

Mr. Addington enjoyed the confidence and even the affection of the king, whose
The King's
confidence
in Mr.
Addington.
correspondence at this period resembles—both in its minute attention to every department of business, and in its terms of attachment—his letters to his former favourite, Lord North.

This administration—formed under circumstances unfavourable to its stability, and beset from its very commencement with jealousy and intrigues—was upheld for three years mainly by the influence of the Crown.

Mr. Pitt
restored
to power,
1804.

It will be seen that in the above examples each line of the side notes is “full out;” this is the more approved fashion, yet sometimes each line is centred; an example of this

method is to be seen in the leading articles of the *Daily News*.

In histories the dates of important events referred to in the text are often inserted as cut-in notes. When this is done the dates should be set in antique, and they are usually larger than the text.

Poetry and Extracts.—These, when appearing within the text, should be set two sizes smaller than the text, and with a thinner lead between the lines. Poetry, of course, is centred according to the longest line; if quoted, the inverted commas should stand out in the margin, so that the first letter of all lines of the same length of metre should range. Extracts may be set as ordinary pars, at full measure, quoted at the beginning only, or every line quoted to the end. Instructions should always be given as to the style to be followed.

Catchwords.—In old books the word, or part of a word, which commenced a new page was always printed at the bottom of the preceding page at the right-hand side just after the last line of the text; in fact, it formed a line by itself run out to the end of the measure. The plan is adopted in books which imitate the old usage and in some legal work. Catchwords are set in the same type as the text and are placed in the white line.

Indentation.—Great care ought to be taken that the paragraphs throughout a book are indented alike. Non-observance of this rule is frequent, and invariably causes much useless trouble to the compositor. The style of different houses varies concerning the amount of indentation. Generally matter up to 18 ems takes one em; from 19 to 24 or 25, one em and a half; over 25, two ems.

Whiting-out.—The dropping and whiting-out of chapter heads should be varied according to the closeness or openness of the text. On a solid page one-fourth or less white is sufficient; on a single-leaded page, one-fourth to

one-third; on a double-ledged page, one-half. Similar graduations of space should be maintained throughout all minor blanks.

Illustrations.—In solid matter, small cuts should be justified or let into the text when it can be done with propriety. If any cut leaves a side measure of less than eight ems of the text, special instructions ought to be obtained before running type down the side of the cut.

When cuts have square or well-defined outlines, leave a margin of about one pica in solid matter, and two picas in ledged matter, on all sides, exclusive of the inscription at the bottom of the cut. When the cuts are of irregular outlines, have the block cut where it has a large shoulder, and put the type as near it as can be done, at uniform distances on all sides. In some styles of illustrated bookwork cuts and text are intermingled in a studiously irregular way.

In a ledged text, cuts are not let into the matter unless they are very small. They should have abundance of margin in ledged matter.

When two or more cuts have to be used on a page, they should be placed apart at equal distances, but in irregular positions. For instance, if we had two or three small cuts to be inserted in a page, the first should be placed two or more lines from the top on the folio side, the second midway in the page on the inner side, and the third four or more lines from the bottom on the folio side again. To ascertain their exact positions, both for margins on the three sides of each, and for lines of text to be allowed between the bottom of one and the top of the other, it is advisable to place the cuts (with quads at bottom equal to their inscriptions) on the top of a solid page of text. They can then be moved a line higher or lower as necessity requires, the exact measures for over-running ascertained, and

the proper page proceeded with in a straightforward manner. The same plan may be followed where cuts are inserted in the middle of text with type all round; only in this instance, and also in that of cuts with type at top and bottom only, two lines more should be allowed below than there is above. If these cuts are centred exactly they have the appearance of being lower on the page than they really are and look bad. In the case of full-page cuts which are drawn the long way of the page, necessitating the inscriptions being placed in the side margins, these should be imposed so that the inscriptions read towards the heads or upwards. When printed, this brings the inscriptions on even pages in the backs and on odd pages in the fore edge. Some houses, however, adopt the plan of having the inscriptions of both odd and even pages appear in the fore edges, thus necessitating the book to be turned round to the left to see one picture and to the right to see the other—a distinctly bad piece of bookwork make-up.

Head- and Tail-pieces.—*Head-pieces* are ornamental designs placed above the commencements of chapters. When used, they should be of the full width of the measure. Throughout a work they should be uniform in width and similar in style. Generally speaking, they should come flush with the top of the page, but certainly not more than a pica drop should be allowed.

Tail-pieces are placed in the whites at the ends of chapters. They should harmonise with the head-pieces, and both should be congruous with the nature of the work.

Initial Letters.—These ornamented letters generally accompany head- and tail-pieces in books. They differ much in style and variety of usage. Some books will have one initial letter to commence the text with; others will have one at the beginning of every chapter. When used throughout a work, they should be consistent. It is better

not to use them in ordinary octavo bookwork, in which, if it is thought best not to begin a chapter with the first word in simple caps. and small caps., the first word may be in full caps., with an ordinary two-line titling letter dropped to form an initial.

When the initials are of a Roman type, or a plain-faced type of any description, the top of each of these characters should be even with the top of the capital letter which succeeds it. If the initial letter is a woodcut or process engraving, it is common to see the filigree work around it rise to the top of the first line of type, and the main lines, or body marks, of the character placed some distance below. But it is more correct to throw the tracery higher up, so that the letter proper shall line with the tops of the caps. of the first word. To throw up the initial sometimes produces a very happy effect. An initial letter must not be crowded against other characters. If the letter is a T, for instance, and the remaining letters of the word are H E, the latter should approach as close to the former as a due regard for the side bearing will allow, and the next lines should be indented so that there is an appearing em of white space between the initial and the indented lines. Below there should be as much white as there is at the side, but this is not always practicable. It is not allowable to double-lead the reading matter at the side when the rest of the matter is single-leaded, that it may be the exact length of the cut, nor may one or two leads be added anywhere to do this. If the matter at the side is leaded, and six lines will not fill the space of the cut, up and down, and leave an appropriate foot margin, add another line, making seven, and leave the beginning of this line blank. It is proper where there is a good margin to each page, and an initial letter is used which has a tendril or other light line thrown out at the beginning, to consider this ornamentation as no part of the page, and to place the cut in such a way that the be-

ginning of the types below will line with the main part of the initial ; that is to say, the tendril or light line is thrown into the margin, and in making up the page the furniture must be arranged accordingly. In imposing, less furniture than usual is required by the stone hand. No initial looks well unless it is given plenty of room.

CHAPTER XXXII.

BOOKWORK (*continued*).—The Style of the House in Setting—Signs:
Religious, Bibliographical, Commercial, Mathematical, Numerals,
Medical, Astronomical, Botanical, Zoological, and Chemical.

Style generally.—It is highly important that a compositor should familiarise himself with what is called the “style of the house.” This sometimes affects not only punctuation, capitalisation, divisions, and spacing, but even the general practices already detailed. It must be thoroughly understood by the compositor, or he cannot expect to have anything but dirty proofs.

Much of the compositor’s time is, in some offices, undoubtedly lost in conforming to arbitrary and unreasonable rules. Matter that would be considered quite correct in one office is unmercifully scored by a reader in another office. Styles are as various, indeed, as the caprices and tastes of publishers and authors. One style insists on even spacing, no matter how words are divided; another style demands unexceptionable divisions, no matter how great may be the irregularity of different lines. Spelling varies; thus in one house we have “hæmorrhage,” in another “haemorrhage,” and in a third “hemorrhage.” In punctuation there is a wide diversity, and in compounding and capitalising words there is no regular fixed law whatever. Some prefer wide spacing; while others consider that an average thick space is sufficient throughout the line. Some would almost rather see an unusually wide-spaced line than have a word divided. Some consider that leaded matter should be double thick

spaced, or even a wider opening made between the words. Others allow almost any division of a word, provided that it is a legitimate one, rather than exceed thick spacing the line.

Some houses use the capitals as seldom as possible ; while others use them very frequently.¹ In many houses where religious books are printed, it is a rule to begin with a capital such words as He, His, Whom, etc., when alluding to the Deity ; and Church works are usually printed with GOD, JESUS, HOLY GHOST, when used personally, in small caps. The words Christ, the Saviour, etc., do not follow this latter rule.

It is most important to use figures systematically ; and not to use words indiscriminately instead of them. Some houses prefer the ages of persons, or any other number, unless in statistical matter, in words rather than in figures. Others prefer a liberal use of figures to save space. Some, again, adopt the plan of putting all numbers under a hundred in words, and all over a hundred in figures. Newspapers generally set all numbers under ten in words. Experience of the different customs practised in various offices is extremely valuable to a journeyman. He must, wherever he be, apply his mind to study the style of the house. The adherence of different establishments to any one plan, though much to be desired, is perhaps hardly to be expected ; but it is only fair that each house should decide upon a code of regulations, and have them printed (as the Clarendon Press, Messrs. Spottiswoode, and some others have done) in order to save the time of the compositor which is lost in making inquiries before he has set up his matter, or in correcting it afterwards ; and in the latter case that of the reader may also be considered.

¹ Where a word is begun with a capital it is said to be "kept up ;" when it begins with a lower-case letter it is "kept down."

The best bookwork is often the result of a great attention to minute particulars. There is no room in a book for display work except perhaps the title, which is of a very limited character. Hence it follows that where taste in display is barred, neatness and uniformity should rule. Perhaps the thing most essential in good bookwork is new type, since nothing looks worse than battered letters, even where press work and binding are excellent. Next to this comes the proper gradation of type in the different parts of the work, and last, but not least, the press, or rather the machine work. For the latter, careful and blameless register is the all-in-all, as well as the maintenance of equal colour throughout and the prevention of slurring and off-setting. To ensure good register, the one who imposes the formes is, to a certain extent, responsible. All chases are not made with mathematical exactness, and of those that are, the cross-bars are liable to get out of the straight after a period of usage. Consequently, greater care is often needed than the mere cutting of a gauge will remedy. The same with the furniture. It does not always follow that because a forme registered well in one sheet the next will, even with the same furniture. Various agencies are at work to prevent this, such as the warping of the furniture and careless locking-up. Careful attention is always necessary, and will always repay itself.

Bookwork should fold into sections of not more than sixteen pages, that they be not too bulky. Of course, it may be worked in more pages at a time if thought desirable, and the machines available are large enough, but in such case the sheets should be cut up before folding.

Signs.—The following is a list of various types used as symbols or emblems, which occur in scientific and technical books, newspapers, etc. It is desirable that the compositor should have a knowledge of their names, as well as their signification; and such knowledge is indispensable to the

reader, and even to the reading-boy. We omit ordinary abbreviations, which are contained in most of the dictionaries.

RELIGIOUS.

✠, the Cross, used in devotional books of the Catholic Church to denote where the reader is advised to make the sign of the Holy Cross. Roman Catholic dignitaries also use this sign before their names. By printers it is called the Square Cross, or Maltese Cross.

† The Latin Cross.

X St. Andrew's Cross.

R̃ Response }
Ṽ Versicle } Used in Service-books, etc.

* In some Roman Catholic service-books the Star is used to denote the distinction between the part monotoned or intoned by the celebrant or the priest, and that repeated or sung by the congregation.

BIBLIOGRAPHICAL.

d.l. description of leaf. In the direction to the binder the position of plates is sometimes indicated thus:—

i. *d.l.* ii. The first plate on *versa*; then the *d.l.*, the second plate on *recto*.

d.l. iii. The description *verso* of one leaf, plate *recto* of another.

The brace shows that the leaves thereby enclosed face each other.

^a*recto* (a right-hand page).

^b*verso* (a left-hand page).

cal°. capitulo (chapter).

F; *f*, *ff*, *fol.* leaves.

h height of page.

3^{ns} ternions (three sheets of paper folded in halves, quirewise, or one inside another, giving 6 leaves or 12 pages).

4^{ns} quaternions (four sheets of paper folded quirewise, giving 8 leaves or 16 pages).

5^{ns} quinternions (five sheets of paper folded quirewise, giving ten leaves or 20 pages).

The following are the signs used in the catalogue of the Bodleian Library, and in other catalogues founded upon it:—

s. a. sine anno (without year of publication).

s. l. sine loco (without place of publication).

s. l. et a. sine loco et anno (without place or year of publication).

s. l., a., et typ. sine loco, anno, et typographi nomine (without place or year of publication or name of printer).

bl. l. black letter.

f. p. fine or vellum paper.

l. p. large paper.

b. m. blue morocco; *g. m.* green morocco; *r. m.* red morocco; *y. m.* yellow morocco; *r.* russia.

al. e. alia editione (another edition).

fol. folio (a sheet folded into halves, making 2 leaves or 4 pages).

4to or 4°, quarto.

8vo or 8°, octavo.

12mo or 12°, duodecimo.

16mo or 16°, decimo-sexto.

18mo or 18°, decimo octavo.

24mo or 24°, vicesimo quarto.

s. signed (the signature printed; or, before the introduction of printed signatures, written with a pen).

n. s. not signed—without signatures.

A useful list of signs, etc., contained in catalogues and descriptions of autographs, books, maps, and prints, especially foreign ones, is contained in *Hints on Catalogue Titles*, by Chas. F. Blackburn (London, 1884, 8vo).

COMMERCIAL.

\$ Dollar.	@ At. ¹
£ Pound Sterling.	Ex out of.
/ Shilling mark (diagonal).	℥ Per.
% Per Cent.	lb Pound Weight. ²
E. & O. E. Errors and omissions excepted.	^a / _c Account.

Various signs are also used as trade marks, such as hearts, triangles, squares. They are cast in pieces, so that various combinations may be made. They are usually pierced in the centre, to contain letters or figures.

LLOYD'S MARKS.

A1 means a wooden ship assigned as a first-class. A1 (in red), Æ, and E, are the succeeding degrees of fitness. The degrees of strength of structure of vessels of iron or steel are indicated by the characters 100A1, 90A1, 80A1.

MATHEMATICAL.

- + Plus, and, or more.
- Minus, less.
- × Multiplied by, times, into.
- ±, or ∓, Plus or minus.

¹ The sign @ is sometimes used for "to," as "Cotton, 15d. @ 15½d."

² This sign should never have an "s" after it to form the plural. Libra, of which it is the sign, forms its plural, libræ. It would be as reasonable to print "£s" for pounds sterling.

Multiplication is also indicated by putting a dot between the factors, as:—

$$2 \times 3 \times 4 = 24 \quad \text{or} \quad 2.3.4. = 24.$$

\div or $:$ Divided by.

Division is also indicated by writing the divisor under the dividend, with a line between them, as $\frac{a}{b}$; $\frac{6}{3} = 2$.

$=$ Equal to.

$>$ is greater than.

$<$ is less than.

\int the difference between.

\propto , Varies as; is proportional to.

The last sign must not be taken for the cursive or writing form of the Greek α .

$:$ Is to ; the ratio of	}	Used to indicate geometrical proportion.
$::$ As equal		

$\cdot\cdot$ Minus, the arithmetical ratio of	}	Used to indicate arithmetical proportion.
$::$ Equal, is equal to		

∞ Indefinitely great ; infinitely.

0 Indefinitely small ; infinitesimal.

\angle Angle.

\wedge or $^{\wedge}$, the angle between, as $A^{\wedge} B$.

Some mathematicians indicate the angle between two lines by placing one of the letters denoting the enclosing lines over the other, as, a_b , that is, the angle between a and b .

\perp Right angle.

\odot Circle, circumference, 360° .

\perp Perpendicular.

\frown Arc of a circle.

\parallel Parallel.

\triangle Triangle.

\simeq Equiangular.

\square Square.

\square Rectangle.

$\sqrt{}$ Root, the radical sign. To denote any other than the square root, a figure (called the index) expressing the degree of the required root is placed above the sign.

— Vinculum.

[] or { } Brackets.

| Bar.

f or F Function. (Various other letters are sometimes used by mathematicians to indicate functions.)

D . Differential; as Dx , the differential of x .

Δ Finite difference.

\int Integral; integral of.

\int_a^b , the integral to be taken between the value of b of the variable and its value a .

M . The modulus of a system of logarithms.

g . The force of gravity.

$^{\circ}$ Degrees.

$'$ Minutes of arc.

$''$ Seconds of arc.

R° Radius of circle in degrees of arc.

R' Radius in minutes of arc.

R'' Radius in seconds of arc.

$'''$ etc. Accents used to mark the quantities of the same kind which are to be distinguished. When the number of the accents would be greater than three, the Roman numerals are used instead of them, as a^{iv} , a^v , a^{vi} . The accents are often written below, as a_{ii} , a_{iii} , a_{iv} , a_v , a_{vi} . Figures, and also letters, are sometimes used for the same purpose, as a^1 , a^2 , a^m , a^n , a_o , a_2 , a_3 .

1 , 2 , 3 . Indices placed above and at the right hand of quantities to denote that they are raised to powers whose degree is indicated by the figure, as a^3 ; that is, the third power of a .

$\sin. x$. The sine of x .

$\sin. -^1 x$. The arc whose sign is x .

NUMERALS.

Characters used to express numbers, as the Arabic numerals, 1, 2, 3, etc., and the Roman numerals, I., V., X.,

L., etc. The Arabic system of notation is known to every one who is acquainted with the rudiments of arithmetic; but the Roman, especially in the higher quantities, often gives some trouble. We therefore present it in a complete form:—

1. I.	40. XXXX., or XL.
2. II.	50. L.
3. III.	60. LX.
4. IIII., or IV.	70. LXX.
5. V.	80. LXXX., or XXC.
6. VI.	90. LXXX., or XC.
7. VII.	100. C.
8. VIII., or IIX.	200. CC.
9. VIIII., or IX.	300. CCC.
10. X.	400. CCCC., or CD.
11. XI.	500. D., or I ₅ C.
12. XII.	600. DC., or I ₅ CC.
13. XIII., or XIIV.	700. DCC., or I ₅ CCC.
14. XIIII., or XIV.	800. DCCC., or I ₅ CCCC.
15. XV.	900. DCCCC., or I ₅ CCCC.
16. XVI.	1,000. M., or Cl ₅ ., or ∞, or X.
17. XVII.	2,000. MM., II Cl ₅ ., Cl ₅ Cl ₅ ., or ∞ ∞.
18. XVIII., or XIIX.	5,000. I ₅ Cl ₅ ., V̄., or V ∞.
19. XVIIIII., or XIX.	10,000. CCl ₅ Cl ₅ ., CM ₅ ., X ∞, or XM
20. XX.	50,000. I ₅ Cl ₅ Cl ₅ ..
21. XXI.	100,000. CCCI ₅ Cl ₅ Cl ₅ ., CM., or C ∞.
30. XXX.	1,000,000. CCCI ₅ Cl ₅ Cl ₅ Cl ₅ ..

MEDICAL.

R Recipe or "take."

ā or āā. Of each a like quantity.

℔. A pound.

℥ An ounce.

ʒ A drachm.

ʒ A scruple.

In medical works the quantities in the formulæ are set in lower-case letters. If the number end with an "i," a "j" is always used in its place, as viij, instead of viii; xj, instead of xi, etc.; "iss" means one and a half; "ss" half of anything.

ASTRONOMICAL.

The Sun and Planets.

☉ Sun.	⊕ Earth.	♄ Saturn.
☿ Mercury.	♂ Mars.	♅ Uranus.
♀ Venus.	♃ Jupiter.	♆ Neptune.

Moon's Phases.

● New Moon.	○ Full Moon.
☾ First Quarter.	☾ Last Quarter.

Aspects and Nodes.

♌ Conjunction.	* Sextile.	♌ or ☉ Quintile.
☐ Quadrature.	Δ Trine.	♌ Opposition.
♌ Ascending node.	♎ Descending node.	

Signs of the Zodiac.

Spring Signs.	{	1. ♈ Aries, the Ram.
	{	2. ♉ Taurus, the Bull.
	{	3. ♊ Gemini, the Twins.
Summer Signs.	{	4. ♋ Cancer, the Crab.
	{	5. ♌ Leo, the Lion.
	{	6. ♍ Virgo, the Virgin.
Autumn Signs.	{	7. ♎ Libra, the Balance.
	{	8. ♏ Scorpio, the Scorpion.
	{	9. ♐ Sagittarius, the Archer.
Winter Signs.	{	10. ♑ Capricornus, the Goat.
	{	11. ♒ Aquarius, the Waterman.
	{	12. ♓ Pisces, the Fishes.

a or a . mean distance.	a or $A.R.$ right ascension.
β Celestial latitude.	$D.$ Diameter.
δ Declination. - $E.$ East.	$e.$ Eccentricity.
h or h . hours.	$i.$ inclination.
$L, l,$ or $\epsilon.$ Mean longitude in orbit.	λ Longitude.
$M.$ Mass.	m or m . Minutes of time.
μ or $m.$ Mean daily motion.	
$N.$ North.	$v, \Omega,$ or $L.$ Longitude of ascending node;
	π or $\tilde{\omega}.$ Longitude of perihelion.
ρ or $R.$ Radius, or radius vector.	$S.$ South.
s or $.$ Seconds of time.	$T.$ Time (periodic time).
$W.$ West	} Φ angle of eccentricity or geographical latitude.
$^{\circ}$ degree.	
$'$ minutes of arc.	$''$ seconds of arc.

ZOOLOGICAL AND BOTANICAL.

♂ male. ♀ female.

CHEMICAL.

+ united with. (In organic chemistry + placed above a letter signifies a base or alkaloid, and — similarly placed signifies an acid.)

Every elementary substance is now represented in chemical notation by a symbol, consisting of the initial or abbreviation of its Latin name, as H for Hydrogen, O for Oxygen, Ag. (from Argentum) for Silver. A compound body made up of single equivalents of its constituency is represented by the two symbols of the respective constituents written side by side; thus H_2O represents a compound of two measures by weight of hydrogen with one of oxygen. (This compound is water.)

CHAPTER XXXIII.

VARIOUS KINDS OF COMPOSITION IN BOOK OFFICES.—Table Work—
Poetry—Algebra—Interlinear Translations.

Table Work.—Figures and words arranged in parallel columns form *tables*. The columns are generally separated by rules. Tables differ from common matter in the measure being subdivided, and various portions of the line requiring to be separately justified.

The setting up of Tables is one of the most intricate departments of the compositor's work. It requires calculation, accuracy, and taste, and the exercise of a considerable amount of patience. If every portion be not properly justified, the matter is nearly sure to be loose, and letters will drop out when it comes to be lifted; and even if "botched up," then the roller will probably, in printing, draw out some of the figures, the absence of which will perhaps render the whole table useless to the reader.

The one principle that runs throughout the whole art of table setting is to regard each portion of a line separated by a rule as a line; to set the stick to that measure, and to justify the matter as if it were a complete line.

The first thing to do, then, is to decide upon the length of these fractional lines. When the copy of a table is given into the hands of a compositor, he is usually told how much the table is to make, or what space it is to cover. It may require to be got into a page of a book, or a column of a newspaper, or on a small card. It is the compositor's duty to do this, if possible, and to exhaust every method for

accomplishing it. Experience will often tell him at a glance that the thing cannot be done in some specified type. He must then try it in a smaller type. If in book or news work, the table may be sometimes divided into two parts; or it may extend over more than a page or column. In the latter case the sanction of the employer or overseer will, of course, be necessary before this can be resorted to. The compositor ought to be able to say with certainty how much the whole will make, and to know, approximately at least, the smallest space into which the matter can be got.

If the copy is reprint, and has to be set up in the same sized type, the work will be very considerably simplified, and it is this sort of copy that should be given to the young compositor when he begins to set up tables. We may illustrate the subject by referring to the following table, which is otherwise useful in the printing office.

The body of this table is set up, as will be seen, in Brevier. The compositor must begin by getting together a proper supply of the sorts of types he will most likely want, as well as the en, em, and other quads, rules, etc.

In a case like this, he may use ready cut or "case" rules, or he may cut the rules for himself. Generally speaking, it is always best to have a supply of ready cut, or what the Americans call "labour-saving" rules, cut to em and en picas respectively; for they not only economise time and trouble, but avoid a great deal of waste of material. We shall suppose that rule of the various lengths required is available.

Every figure is an en in width. This fact materially assists justification in table work.

We will now apply ourselves to the table to be composed. In a case of this kind it is often best to leave the setting up of the head undone till after the body of the table is finished. We begin with the "number of copies" column,

Running the eye down the column, we see that the maximum number of figures in it is four, and as every figure is an even en, the width of this column must be four ens, or two ems. Make up a stick to this measure, and set each line, going regularly down the column. Before the 50 an em quad will be required, before the 100 only an en quad, and after 750 no indentation whatever is necessary. Put up a galley on the case, and carefully empty each stickful on to it. Measure the length of the rule wanted, and put one in. The line "number of copies" need not be set up now, for it can be varied in length, as circumstances require, afterwards. Next set the column beginning 2 2. The last line but one shows the maximum space that will be wanted; that is, 3 ens (for the 166) + one en for the quad (dividing the two denominations, quires and sheets) + two ens (for the 16), total 6 ens = 3 ems. This, too, will be the measure of the next column, which must be set up exactly in the same way as the first was. The succeeding columns must be treated in a similar manner. If space will permit, the table will be improved in appearance by placing an en quad down each side of the columns to bear off the rule, as is shown by the two end columns, "Number of Copies."

Another method would be the following. Having gauged the width of the columns, and having set the small heads and whites, proceed next to set up the body of figures in one measure—in the above table, 38 ems brevier. Care must be taken to keep the columns distinct in the quadding. When completed, lay the galley on a flat surface; wet the matter, and slide the rules and leads in. This can be done without much trouble, and the inconvenience is obviated of setting each column in its own narrow measure.

In tables consisting of columns of names, addresses, qualifications, etc., such as voters' lists and the like, a method is adopted of setting all these columns in one

measure of the stick and emptying like common matter, thus saving a deal of time. A set of gauges is made, the first being the width of columns two, three, and four; the second the widths of columns three and four; and the third the width of column four only. In commencing to set, the longest gauge is placed in the stick and the line in the first column composed; the first gauge is then lifted out and the second one inserted, leaving column two open. This line being set, the gauges are changed again, this time leaving the third column open; lastly the third gauge is removed, leaving the end column open, which being set completes the line. Of course, no time is lost in changing gauges, and the whole table can be set straight across and the rules inserted afterwards.

The preceding exemplifies the methods of setting table work generally, but its application to different cases often involves a large amount of trouble and manœuvring. A few hints may be given for adoption in certain emergencies.

If you have a very narrow measure to set, place pica quadrats in the stick, and make it up to that, plus the measure to be set. You may thus much more conveniently set up a short line, of course removing the pica quads before lifting out the matter. For instance, instead of making the stick up to 3 ems make it up to 7, and in every line place a 4-em quad, leaving the rest for the figures. When you empty the stick remove the 4-em quads.

Frequently, the heading determines the width of the column. Hence it is necessary to examine the headings before deciding upon the measure of the column, and if there is anything peculiar in them, or they are heavy and the column light, set them up first.

If a number of lines succeeding each other are indented by or followed by an em quad, it is best to use, not single em quads for each line, but 3 or 4 em quads placed sideways, and serving for as many lines. These make the table

stronger; indeed, as a general rule, in table work, as in all composition, use as few pieces as possible.¹

Whenever practicable, get the columns of equal breadth. Similar measures give symmetry to the work, even although the matter in the columns does not always quite fill them up.

Headings are set in type at least two sizes smaller than the body of the table; but if the body is nonpareil or less, the heading may be in the same type.

At the bottom of each column, endeavour to get in a quad to the full measure, or if more than 4-em, put in as large pieces as possible. This strengthens the column. If there is not room for the quads, cut a lead to the size, and insert that as a stay.

Never mix the founts in the body of a table, if it can be at all avoided. If the table is in brevier, use brevier throughout, even if minion or other spaces now and then would apparently give less trouble in justifying.

If headings are wanted to be used again for new sets of tables, it is best to compose them so that they are complete in themselves, and can be lifted away from the matter without interfering with it. In the example given, a rule the full width of the table might be used under the line containing the *q. s.*, and the column rules cut accordingly. But *it is the neatest plan to make all the upright rules of one piece, and to make the cross or transverse lines composite.*

Especial care should be taken by the compositor that his rules are the exact length required. If any of them are too long, and extend beyond the matter, they will "bind" it, and cause the column to be loose, as the rule and not the types will get the force of the locking-up.

If not evenly cut, the rules also may bind at one portion;

¹ One exception is, to avoid a hair space; it is better to put a middle space, thick space, and an en quad at the end of a line, than an em quad and a hair space.

but this cannot happen if a rule cutter in proper order is used.

The width of the columns must be very exactly cast off. Any error in this calculation may prevent the table corresponding with the copy, or may make it too large or too small for the space required to be filled.

Calculate the width of the columns *in ems of the type in which the body of the table is to be set*. If this be done, the small cross rules can be set in *metal rules* of the same fount, if they are not very long. Brass rules, however, look neater, and do not give much more trouble.

In estimating the width, the comma may be reckoned as an en: a middle space will make up the difference; but if the comma is cast on a thick space body, then reckon it as such, and add two other thicks to complete the em.

Where possible, allow some space between the rules and the columns of matter, an en or an em space according to circumstances. Endeavour especially to leave some white at the top and bottom of the column; a space equal to an en is the usual quantity.

Each column heading should be placed in the middle in respect to that column, and the last line (if the heading is in more than one line) should have a white line after it and before the rule.

Some good printers adopt the plan of inserting no full points whatever in headings, except when words are abbreviated. They urge that words so used do not form sentences, and therefore need no grammatical points.

A heading may run up a column or across it. If a table is wider than the measure of the page, it may often be got in by turning it broadwise. It must then read from the bottom of the page upwards. If it extends over two pages, it should be divided equally in the centre, and will be then read across both pages.

In setting money columns, place an em quadrat between all

single figures, and an en quadrat before double figures ; thus
 —1 5 11 The next line will then range properly, as
 —2 17 6

Before beginning to set money or other columns, notice whether there are farthings or fractions at the end of any of the lines. If there are, the lines must not extend to the end, but an en quad must be inserted to allow of the fractions.

When it is necessary to split a balance sheet into two pages, they must, of course, face each other. The full rules running along the head must be connected by taking them into the furniture of the gutters, so that when bound the rules may meet. The idea is, for the balance sheet to preserve its entirety, although the usual margin of the gutters intervenes.

Poetry.—In setting up poetry the chief requirement is to get the matter as near the middle of the page as possible. The lines, being of irregular length, will frequently extend further over the page on one side than on another, but this should be avoided as much as possible.

The next thing is to decide upon the indentation. When the copy is in manuscript this point often gives trouble to the tyro, as he does not know what lines to make full out, and what to set in. A few directions may therefore be useful.

The principal object of indenting poetry is to cause lines of the same metrical length to range with each other, as in the following example :—

The Church's one foundation
 Is Jesus Christ our Lord ;
 She is His new creation
 By water and the Word :
 From heaven He came and sought her
 To be His holy Bride.
 With His own blood He bought her,
 And for her life He died.

Here it will be seen that the lines of seven syllables or metres range, and those with six, being indented one em each, also range, thus allowing the lines ending respectively with "foundation" and "creation," "Lord" and "Word," to be similarly indented. If two lines come together that are rhymed, they must, following the same rule, have an equal indentation, as in the last two lines (or refrain) of the following verse:—

Faith of our Fathers! living still,
 In spite of dungeon, fire, and sword;
 Oh, how our hearts beat high with joy,
 Whene'er we hear that glorious word:
 Faith of our Fathers! Holy Faith!
 We will be true to thee till death.

If a line be too long for the measure, the end of it may be turned over into the white of either the preceding or the following line, and a bracket may be prefixed to it to divide it from that line. This plan is not so neat in appearance as that of making a fresh line (considerably indented) of the redundant matter.

The first word in each line of poetry should begin with a capital letter. In some kinds of humorous poetry, however, a word is occasionally broken at the end of a line to make a rhyme, and the remainder placed at the beginning of the next line. In this case the rule as to commencing a line with a capital is not adhered to.

Some lines being short in proportion to the others are usually indented several ems, as in the following example:—

Shades of night are falling all around us,
 Shine through the gloom, O Light of Light Eternal;
 Sons of the Day, we seek Thee, Jesu, Master,
 Lighten our darkness.

Some printers say that the indentation should be one em for each foot (of metre) of which the line is short, but this rule is seldom acted upon, and is often not practicable.

If poetry is much narrower than the measure of the page the stick may be set to a shorter measure, care being taken that it will be sufficient for the longest line. The difference between this measure and that of the page may be made up afterwards with quotations or furniture.

Blank verse is set full out in every line except where in prose a new paragraph might begin, in which case the line is indented an em, thus :—

“ Lo, to confirm thy faith, I nod my head;
And well among the immortal gods is known
The solemn import of that pledge from me:
For ne’er my promise shall deceive, or fail,
Or be recalled, if with a nod confirmed.”

He said, and nodded with his shadowy brows;
Waved on the immortal head the ambrosial locks,
And all Olympus trembled at his nod.

Algebra.—The composition of algebra is much more difficult than would appear at first sight. This is owing to the apparent familiarity of the matter, the necessary sorts being contained in nearly every ordinary fount, with the exception of a few signs. It is the proper arrangement of the matter (which cannot always be indicated on the manuscript copy) that gives trouble to the compositor. The rudiments of algebra are so simple that the compositor who has much of this kind of work to do would find himself well repaid by devoting a little time to acquiring them.

The algebraic quantities are almost invariably set in italic lower case. But if it should happen that the explanatory portion of the work is in italic, then the algebraic quantities are set in Roman lower case, by way of contrast.

If capitals are used, they must be in Roman, unless marked italic by the author.

In setting equations of two or more lines, the similar

expressions in each should be placed one above the other, as :—

$$\begin{array}{r} 8x + 9y + 8z = 27 \\ 12x + 12y + 10z = 36 \\ 3x \qquad \qquad - \quad z = 9 + y \end{array}$$

When an equation is too long for the measure of the page, it should be divided at the +, -, or =, and each part must be justified in the centre of the line which it occupies; or the second line may be run out to the full extent of the measure. Put the + or - or = in the second line in a turn-over.

Such words as "hence" or "therefore," when used in this kind of work, should be placed at the commencement of the line; and when a figure is put in as a direction to some other formula it should be put, within parentheses or brackets, at the outer end of the line.

The short part of a fraction should be justified in the centre of the long, without reference to being either divisor or dividend, and the rule which separates them should be equal in length to the larger part, as

$$\frac{bcx - y}{a} = \frac{z}{a + b + c}$$

In putting together such examples as the above, the most expeditious mode of proceeding is to look along the line and compose the longer part of each fraction with the signs which may be between the fractions, as

$$bcx - y = a + b + c$$

The lines so composed should be placed on a galley, and each of these portions can be put in the composing-stick as required, and the remainder of the compound line can be finished with very little trouble, and without loss of time.

For the decimal point most persons use a period in the

ordinary position; others invert it, making the dot like a superior. The author's copy should be followed on this head. Whichever plan is adopted it must be carried throughout the work.

The chief difficulty in algebraical work arises from the "building up" of equations, etc. The work is greatly simplified if the italic lower-case letters—*a, b, c, d, e, f, m, n, r, x, y, z* are most used—are obtained cast to ens, and the rule is cut to ens and ems of the type used. The chief points to be observed are the centring of factors or terms coming between fractions, and the insertion of leads above these terms to balance the rules used to form the fractions.

When the work runs to any considerable length the signs should be laid in a pair of cases, the upper case consisting of inferior and superior letters and figures, and figures for recurring decimals, and the lower case of split fractions and the most commonly used signs. They may be laid according to the plan that fancy or economy may suggest. Where there is not much of such work in the office the use of "quarter cases," four of which fit into a sanspareil case, is recommended.

Interlinear Translations.—In composing work of this kind the lines must be spaced so that the translation will be centred under those words of the text to which it relates. In order to do this correctly, the compositor must set up the longest words or phrases in both until the line is filled. Take, for example, the lines below:—

<i>Omnes</i>	<i>vici</i>	<i>atque</i>	<i>omnia</i>	<i>ædificia,</i>	<i>quæ</i>
all	the villages	and	all	the buildings,	which
	<i>quisque.</i>				
	any one.				

We choose "*Omnes*" because it is longer than "all," "the villages" because these are longer than "*vici*," and

so on. The line in the stick when fully set will read thus:—

Omnes the villages *atque omnia* the buildings, which
quisque.

The words of the translation must now be taken out, and the short words of the text set and justified in the centre of the spaces they leave; the translation must then be set in the stick so that the word or words fall under the word or words of the text to which they relate, that the whole may appear as first printed above.

When only a few words in a line are overlined, the English may be set first and the overline justified without going to this trouble.

CHAPTER XXXIV.

COMPOSITION FOR TWO OR MORE COLOURS.

SOME books are printed in two colours, generally black with red initials or borders ; a line or two of the title page being also in red. Such work requires that there should be two formes for each set of pages—one to give the impression in black and the other to give the impression in red—and it is obvious that one must be the complement of the other, that is, that the exact spaces filled by type, rules, ornaments, etc., in the one shall be filled by quads, spaces, leads, or furniture in the other.

The most familiar examples of a book in two colours are the Red Rubric Editions of the Book of Common Prayer, and, accordingly, we select part of a page of that work to illustrate our instruction in the kind of setting required.

MORNING PRAYER.

¶ *Then the Minister, Clerks, and people shall say the Lord's Prayer with a loud voice.*

OUR Father, which art in heaven, Hallowed be thy Name. Thy kingdom come. Thy will be done in earth, As it is in heaven. Give us this day our daily bread. And forgive us our trespasses, As we forgive them that trespass against us. And lead us not into temptation ; But deliver us from evil. Amen.

¶ *Then the Priest standing up shall say,*

O Lord, shew thy mercy upon us.

Answer. And grant us thy salvation.

Priest. O Lord, save the Queen.

Answer. And mercifully hear us when we call upon thee.

Priest. Endue thy Ministers with righteousness.

Answer. And make thy chosen people joyful.

Priest. O Lord, save thy people.

Answer. And bless thine inheritance.

In the annexed example, we shall suppose that all the italic, as well as the large O at the commencement of the Lord's Prayer, is to be printed in red, the remainder being black.

The first thing to do is to set up the whole matter, red and black parts alike, as if it were going to be worked as an ordinary forme in one colour. The example given is in nonpareil, the measure being 12 ems pica. There is a line of nonpareil quads above the words "Morning Prayer," then comes the line of nonpareil containing those words, then another line of nonpareil quads, then the two lines of italic set solid, then two 6-to-pica leads, and then begins the Lord's Prayer, which is 8-to-pica leaded, the initial O being a two-line nonpareil letter. Between the prayer and the next line of italic (which is centred) is a line of nonpareil quads, and after the italic line come two 6-to-pica leads. The rest of the matter is 8-to-pica leaded, and is set full out and indented. Having set up the page thus, we impose it in a chase, and take two or three pulls of it at a press. We then wash the forme and unlock it, and place the matter on a galley, putting another galley beside it. We now set up in a composing-stick (stick No. 1), set to the 12 ems measure, two lines of nonpareil quads, or, what comes to the same thing, one line of pica quads, as an equivalent to the first two lines of italic, and in another composing-stick, set to the same measure (stick No. 2), we place three lines of nonpareil quads, or one of pica quads and one of nonpareil, as an equivalent to the line containing "Morning Prayer," and the white lines above and below it. We now transfer from the galley to stick No. 2 the two lines of italic, and take from stick No. 1 the two lines of nonpareil quads, or the one line of pica quads, and put them on the galley in the place whence the italic was taken. We now take from the galley and put into stick No. 1 the first two lines of the Lord's Prayer; we remove the initial O, and fill up the space it occupied with quads

and spaces, having done which we return the two lines to their place in the galley. The O we put in stick No. 2 and then complete the line with nonpareil quads, followed by an 8-to-pica lead and another line of nonpareil quads, taking care to justify properly. We next transfer the matter in stick No. 2 to galley No. 2. We have now to place on this galley as many lines of quads and leads as are equivalent to the remaining lines of the Prayer, the 8-to-pica leads separating them, and the line of nonpareil quads separating the Prayer from the italic line following it. By counting, we find there are six lines of nonpareil (including the line of quads) and five 8-to-pica leads, and we may put into our stick and transfer to galley No. 2 the same number of lines and leads; but it is not desirable to set up nonpareil and use leads when pica quads will do, and the six lines of nonpareil and the five leads are equivalent in depth to three lines of pica—plus one of nonpareil, plus one 8-to-pica lead: we accordingly set these in our stick and transfer them to galley No. 2. The line of italic has now to be transferred to that galley, and its place in galley No. 1 filled by a line of nonpareil quads. We now put into galley No. 2 two 6-to-pica leads, followed by a line of nonpareil quads and an 8-to-pica lead. Then we lift from the first galley the line “Answer, And grant, etc. ;” the word “Answer” and the full point we put into stick No. 2 and fill out the measure with nonpareil spaces and quads, following it with an 8-to-pica lead; the rest of the line we place in stick No. 1, filling up the space that was occupied by the word “Answer” and the full point with nonpareil spaces and quads, and then transfer to the stick the 8-to-pica lead. The rest of the matter is treated in precisely the same way, and the sticks are then emptied on to their respective galleys. We now have on these galleys two pages of type which should be precisely of the same dimensions, and one should be the exact complement of the other. To test this, fold vertically one of the proofs close to the commencement of the lines,

and place it, so folded, against the matter in galley No. 2: if the type in the galley corresponds with the italic and initial in the proof all will be right. (The italic line "Then the Priest, etc.," will be tested by a vertical fold down the middle, and afterwards by a horizontal fold close to it.) The black page on galley No. 1 will be tested in the same way, and if all is found right the two pages may be put aside, for if properly imposed and properly treated on the press or machine the lines and words of red will print exactly in the places required.

Printings in two colours are more common in jobwork than in bookwork, but the method pursued is the same, or substantially the same. Suppose we had to set a quarto circular with two lines of red in it, one about three inches lower than the other. We should set all in one page and pull proofs; we should then remove the two lines to be printed in red, and put between, above, and under them sufficient metal furniture, quads, and leads to give them their proper position, and we should test this by applying the proof folded vertically down the middle (or at such place or places as will show the exact positions of the lines), adding to or taking from the "whites" we had put in according to requirement.

Suppose we had to set such a line as this:—

Bought of JOHN ROBINSON;

in which the B J and R were required to be in red. We should set all up as it appears above; then, in the stick, we should remove the B and replace it with spaces and quads and afterwards treat the J and R in the same manner. Our line would then appear thus:—

ought of OHN OBINSON.

We should then commence the red line by putting into the stick the same number of quads as at the beginning of the

original line and following them with the B. We then observe the distance between the B of Bought and the J of John, and put into the stick just so many quads and spaces as are necessary and follow with the J; we then observe the distance of the R of Robinson from the J of John, put in the equivalent quads and spaces; follow with the R, and then complete the line with spaces and quads. We now have the red line just below the black, thus:—

	ought of	OH	N	OBINSON.	<i>for black.</i>
B		J		R	<i>for red.</i>

A glance should show whether the three initials are in their proper places; should they not be, we alter the spacing until we get them quite right. If the line has been set without a setting-rule the spacing is the more likely to be correct.

The work being finally found satisfactory, the red line should be lifted and placed by itself, and the black line then lifted and placed by itself; and if the formes are made up properly the red letters should print exactly in their proper positions.

Where pages of type are surrounded with borders, whether plain rule or fancy, which are to be printed in another colour, the same course should be adopted, but it is generally desirable to use a proof in black of the letterpress with the border around it to make sure that the space between the letterpress and the border is correct.

Whatever the size of the page or forme, and whether the types are of metal or wood, the same plan is pursued.

Formes of three or more colours are prepared in the same way as for two; there must be just as many formes as there are to be colours, and each will contain the types which are to print in their own colour and "whites" for all the rest, the relative positions of the types and whites being arranged and tested as before described.

When formes are accurately made up in this way, it rests with the pressman to see that the various printings "register," that is, that the impressions from each are made on the paper exactly where they should be; for of course the same paper goes through the press as many times as there are formes.

Other Methods.—If the work in hand is a placard or handbill composed of large types, and only a few copies of it are wanted, it may save time to adopt another plan. The lines or letters to print in the different colours may be lifted out of the black forme and inked, and then when the rest of the forme has been inked, dropped into it again. Thus one impression completes each sheet. This is the most expeditious way of working window bills and show cards of which, perhaps, not more than a dozen copies are required. It also secures perfect register, but between every impression the forme has to be unlocked and locked up again, and the inking is not always as good as it should be. Another method adopted in small, tasty jobs in two or more colours is to underlay with a nonpareil lead all parts to be printed in the first colour, the rest of the forme being planed down below it. This colour is then worked off, the forme lifted, underlay leads removed to lines or ornaments for the next colour, and so on. This can be done at press but not at machine, and the forme can be laid accurately each time on the press by means of a pencil mark drawn round it. This is very handy in the case of a solid pica band within a border which would be very effective in deep red or gold. By underlaying this border with nonpareil quads, and after working, removing them and underlaying the remainder of the forme with nonpareil leads, the job may be worked and dead register be a certainty.

CHAPTER XXXV.

COMPOSITION IN GERMAN, GREEK, AND HEBREW CHARACTERS.

IN some offices which have made a speciality of this kind of work, a very considerable amount of the composition is done in foreign languages, and with other than Roman letters. In these offices both compositors and readers have to be acquainted with a variety of alphabets, and to possess a knowledge of at least their signification and use. The ordinary compositor seldom requires to know more than the Roman and italic characters, for in these are set up all copy in the English, French, Spanish, Italian, and some other spoken languages, as well as Latin—to a large extent the learned language of the whole world, past and present.

There are, however, two, or perhaps three, alphabets very commonly used, even in ordinary offices, which it is advisable the printer should understand—the modern German and the ancient Greek and Hebrew. Work in each of these languages is highly paid, compared with work in the English language.¹

¹ It is suggested in the interests of printers who have not enjoyed a polyglot education, that the letters or types of unusual alphabets should be numbered, in Arabic numerals, on their sides, as furniture is marked, or as the mark or name of the founder is placed to machine-cast types. These numbers might correspond with the table of the alphabet. If the plan were perfectly understood, the copy could be written in figures, and the composition of the most abstruse language be rendered to the unlearned workman as simple as that of a line of numerals.

Neither the German nor the Greek language presents much difficulty, if the value and force of the characters composing their alphabets are understood. The doubts that arise are occasioned generally by the careless or awkward writing of the copy, some authors being very remiss in this respect. We propose, therefore, to give in regard to each: 1. A list of the characters of which the alphabet is composed. 2. Some remarks on the positions in which the accents and punctuational points are usually found. 3. The lay of the case, as adopted in the best modern offices.

THE GERMAN ALPHABET.

Character.	Signification.	Character.	Signification.
Ä a	A a	Ń n	N n
ß b	B b	Ŏ o	O o
Ĉ c	C c	Ŧ p	P p
Đ d	D d	Ũ q	Q q
Ė e	E e	Ŗ r	R r
ƒ f	F f	Ţ ſ	S s
Ĝ g	G g	Ť t	T t
Ĥ h	H h	Ũ u	U u
İ i	I i	Ŧ v	V v
Ĵ j	J j	Ŧ w	W w
Ķ k	K k	Ŧ x	X x
Ĺ l	L l	Ŧ y	Y y
Ţ m	M m	Ŧ z	Z z

There are also the modified vowels—Ä Ů Ů ä ö ü (ae oe ue), and the following double letters: Ĥ (fi), ĤĤ (ff), ĤĤ (fi), Ĥ (ch), Ĥ (ck), Ĥ (si), ĤĤ (ss, used in the middle of a word), Ĥ (ss, used at the end of a word), Ĥ (st), Ĥ (tz).

One of the greatest difficulties in German work is encountered when matter is set up from MS. written in German characters. Every compositor who does much

German work should have a good acquaintance with German characters as written; they differ from the printing characters, and also from the writing characters used by the English.

Memoranda.—The following are the letters which are most liable to be mistaken for others, especially by compositors who are not acquainted with the language :—

ℬ (B) and ʒ (V).

It will be seen that while the first has a line across the middle, the latter is open.

℄ (C) and ℄ (E). Ɔ (G) and Ɔ (S).

The ℄ may be known by its small horizontal stroke in the middle, projecting to the right. The ℄ has not a stroke of this kind.

The general appearance of the G and that of the S are pretty much alike, and indeed they are often wrongly printed, the one being substituted for the other. It will be seen, however, on examination, that the Ɔ (S) has an opening at the head, while the Ɔ (G) is closed, and has also an upright stroke inside.

℞ (K) ʀ (N) and ʀ (R).

The first is rounded at the top; the second is open in the middle; the third has a crossing stroke in the middle.

℡ (M) and ʒ (W).

It is only necessary to observe that the M is open at the bottom, while the W is closed.

I and J are alike. The long s is used initially and medially, the short s finally. The latter are always retained in compound words when they occur finally. The caps. A, O, U with the "umlaut" (¨) over them are sometimes printed Ae, Oe, Ue, instead.

b (b) and h (h).

The b is altogether closed at the bottom, but the h is slightly open, ending at the bottom with a hair-line.

f (f) and s (s); fi (fi) and si (si); ff (ff) and ss (ss).

The f has a horizontal line completely through it, near the middle, while the s has a short line on the left side only. In some founts the two letters differ slightly in thickness, which is a material help in both composition and distribution.

m (m) and w (w).

The m is entirely open at the bottom, while the w is partly closed.

n (n) and u (u).

These letters are very difficult to distinguish, especially when distributing. The difference is plainly apparent when carefully looked into, which is a somewhat trying operation, especially as these letters occur so frequently.

r (r) and x (x).

The x has a short hair-stroke at the foot, running to the left, which the r has not.

v (v) and y (y).

The v is closed at the foot, while the y is a little open. The latter also has a hair-stroke which is not found in the former.¹

Lay of the German Case.—Within the last few years several important alterations have been made in the lay of

¹ It would be possible, no doubt, to find analogies in several of the other letters. The preceding list was drawn up by a practical reader, and embraces those letters only in which, as experience has shown, compositors are apt most frequently to make mistakes.

the German case, having for their object the assimilation of the arrangements of those used in England to those used in Germany.¹ We give the most usual "lay" at the present

				ü	ö	ü	
h	b	c	d	e	f	g	
h	i	k	l	m	n	o	
p	q	r	s	t	v	w	
x	y	z	u				

UPPER CASE.

!	hair	thin	mdl	i	f		ä	ö	ü	fi	ff	ß	t	d
?	b	ch		b		e	i	f	s	f	g	ff	ll	
c												fi	p	
fl	l	m	n		h		v	ft	g	,	w	en quad.	em quad.	
y														
x	v	u	t		Thick Space.		a	r		;	:		Quads.	
q										.	=			

LOWER CASE.

time in the principal London offices; and if the compositor understands this one, and the general information concerning the alphabet and the equivocal letters, so to speak,

¹ It is, however, open to question whether the plans as used in Germany are better for English compositors than those lays which more nearly approximate to the English lay of the English case. The latter lays are by far the most natural and come easiest to the unlearned compositor, besides enabling the workman to produce as many ens per hour, if not indeed more.

already presented, he will have no difficulty in working at others slightly varying in their arrangements.¹

The lower case contains the bulk of the characters. The arrangement of spaces and points should be conformable to the lay of the other cases adopted in the office.

THE GREEK ALPHABET.

The Greek letters are twenty-four in number, and are thus formed and designated:—

Character.	Significa- tion.	Name.	Character.	Significa- tion.	Name.
A α	a	Alpha.	N ν	n	Nu.
B β	b	Beta.	Ξ ξ	x	Xi.
Γ γ	g (hard)	Gamma.	Ο ο	o (short)	Omicron
Δ δ	d	Delta.	Π π	p	Pi.
E ε	e (short)	Epsilon.	Ρ ρ	r	Rho.
Z ζ	z	Zeta.	Σ σ s	s	Sigma.
H η	e (long)	Eta.	Τ τ	t	Tau.
Θ θ	th	Theta.	Υ υ	u or y	Upsilon.
I ι	i	Iota.	Φ φ	ph	Phi.
K κ	k	Kappa.	Χ χ	ch (hard)	Chi.
Λ λ	l	Lambda.	Ψ ψ	ps	Psi.
M μ	m	Mu.	Ω ω	o (long)	Omēga.

In old Greek founts there are the following alternative or cursive characters: β (beta) and θ (theta); they are not found in modern founts.

The Greek alphabet contains seventeen consonants and seven vowels. The characters are so distinct in their shape

¹ The spaces left blank are filled up variously. The reference marks and figures (Arabic) generally occupy the upper boxes of the right-hand side of the case, and the commercial signs, such as \$, ¢, /, the braces, dashes, and fractions, the left-hand boxes. It is not necessary, therefore, to appropriate the other boxes, especially as they are generally arranged as are the ordinary English cases in each particular office. Much German work is now set in Roman types.

that they can hardly be mistaken one for the other. The chief difficulty in Greek composition arises from the accents; hence we extract the following from a grammar of the language:

The *accents* are three: the acute (´), the grave (`), and the circumflex (˘).

The *breathings* are two: the rough, or *asper* (ʹ), and the smooth, or *lenis* (͵).

The rough breathing is equivalent to our aspirated *h*; but the smooth has no power.

A vowel or a diphthong *may* be accompanied both by a breathing and an accent; as in the following instances: ἔλεγος, ᾠραὶ, οἷστρος, οἷτινες. These combinations have the following names:—

* Lenis acute.

ª Asper grave.

* Lenis grave.

* Circumflex lenis.

ª Asper acute.

ª Circumflex asper.

The following also occur in combination with diæresis (¨):—

ª Diæresis acute.

ª Diæresis grave.

The following rules may be pointed out as being essential to be known by the printer:—

A vowel or diphthong beginning a word has one of the breathings over it; the vowel *upsilon* admits only of the asper. An accent alone is never used on the first vowel.

The letter *ρ* at the beginning of a word has an asper over it, and where two *ρ*'s meet in a word, the first has a lenis and the other an asper.

In diphthongs the accent and breathing are placed over the second vowel, as—*αῖτη*, not *ἄντη*.

The apostrophe (') is used to show the omission of the vowels *α*, *ε*, *ι*, *ο*, and the diphthongs *αι* and *οι*, when they stand at the end of a word and the next word begins with a vowel, as—*παρ' αὐτῶ* for *παρὰ αὐτῶ*.

Sometimes the apostrophe contracts two words into one, as—*καὶ γὰρ* for *καὶ ἐγώ*.

Sometimes an apostrophe supplies the place of a vowel beginning a word, as—*ὦ γὰρ* for *ὦ ἀγαθὲ*; this occurs chiefly in poetry.

But the prepositions *περὶ* and *πρὸ* suffer no elision, though the next word begins with a vowel, as—*περὶ ἑμῶν*, *πρὸ ἐμοῦ*, etc.

The diæresis (") separates two vowels, that they may not be pronounced as a diphthong: thus, *ἀντὶ* with a diæresis makes three syllables, but without a diæresis *av* is a diphthong, and makes *αντὶ* two syllables.

The Greek note of interrogation is the Roman semi-colon [;].

The colon, in Greek, is an inverted full point [·].

The following practical rules are very useful for the unlearned compositor:—

(1) No accent can be placed over any other than one of the last three syllables of a word.

(2) No vowel or diphthong can have the asper or lenis except at the beginning of a word.

(3) The grave accent never occurs but on the last syllable; and this being the case, the asper grave and lenis grave are required for only a few monosyllables.

(4) Almost every word has an accent, but very seldom has more than one; and when this happens, it is an acute, thrown back upon the last syllable from one of those words called enclitics, which in that case has none, unless it be followed by another enclitic. (Words known as enclitics are monosyllables without accents.)

(5) In no other case than this can a last syllable have an acute accent, except before a full point, colon, or note of interrogation, when a grave accent on the last syllable is changed to an acute.

The latter fact has often led compositors not understanding

the language to believe there was an error in the copy, by finding the same word written with two different accents. When their proof was returned to them corrected, they have seen the mistake into which they have been led.

The letter sigma at the end of a word is always in the form σ ; in every other position it is σ .

The letters β , θ , and τ are frequently written ε , ϑ , γ .

There are at least six useless accents in the founts of Greek as ordinarily cast. These are— $\acute{\epsilon}$, \hat{o} , $\tilde{\epsilon}$, $\tilde{\epsilon}$, δ , δ . In some founts the last four are omitted, but the other two are always present. If the accents are chipped off they do for lower-case letters.

Greek MS. is rather perplexing. Not only are the accents carelessly placed, but some letters, though written as printed, are nevertheless joined when opportunity offers. We may instance π and $\tau\iota$, ov and ω , $\sigma\tau$ and $\sigma\tau$, which should be carefully distinguished. Some other letters resemble each other very much in MS. They are δ (a symbol for ov), v , and ν ; ξ and ζ ; σ and σ ; ν and s (at the end of words).

The letters ς and γ , given in the plan of Greek cases, are now never used. They belong to the old set of ligatures rejected by modern printers, and represent $\sigma\tau$ and ov respectively. They are never supplied in modern founts, though they are always present in cases which were not laid within the last thirty or forty years. The second form of the ρ (g) is also omitted. This and other alternative letters (as π for π) were used chiefly for embellishment.

The α , ϵ , η , o , v , ω , cast with kerns, are very seldom used. They are supplied in a fount chiefly to supply deficiencies in accented sorts. Accents can be "made" by combining them with the detached accents placed in the bottom row of the cap. side of the case. The same with the kerned subscript letters q , η , ϕ . The $\hat{\eta}$, owing to its frequent usage, is sometimes cast whole.

Accented caps. carry the accents before them ($^{\circ}\Omega$). Caps. with a subscript are either "kept down" or an inferior iota

Note.—The characters 6, 9 (*beta, theta*) not being cast in new founts, the space appropriated to them here may be left blank or assigned for other purposes. The digamma (*F*), used frequently in philology, may occupy one of them.

THE HEBREW ALPHABET.

The following are the letters of the Hebrew alphabet :—

Form.	Power.	Name.	Form.	Power.	Name.
א	a breathing	Aleph	מ (final)	m	Mem
ב	bh, b, v	Beth	נ	n	Nun
ג	gh or g	Gimel	ס	s	Samech
ד	dh or d	Daleth	ע	gn or ng	Oyin
ה	h	He	פ	ph or p	Pe
ו	v	Vau	צ	tz	Tzade
ז	z	Zain	כ	k	Koph
ח	ch or h	Cheth	ר	r	Resch
ט	t	Teth	ש	sh	Shin
י	y	Yod	ס	s	Sin
כ (final)	kh or c	Caph	ת	th	Tau
ל	l	Lamed			

There are, besides, two points like full points called *Dagesh* and *Mappik*. They are put in the bodies of certain letters to modify pronunciation. Thus the consonants, ב, ד, ה, כ, פ, ת, with a dot in them (*dagesh*) are hard ; without, they have a soft sound : *e.g.* :—

פ = p.

פ = ph.

ת = t.

ת = th.

In addition there are very many accents, but they are often dispensed with.

In the case of other consonants, the dot means that they are doubled. Hebrew words are never divided. Hence six of the letters are cast broad, and used at the end of words for the purpose of justification. They are—

Aleph.	He.	Cheth.	Lamed.	Mem.	Tau.
א	ה	ח	ל	ם	ת

The letters given above are all that are absolutely necessary in printing Hebrew. Various marks have, however, been invented for the purpose of denoting the vowel sounds, and thus to facilitate the reading of the language. They are called masoretic points, and a knowledge of them is indispensable to every compositor employed on Hebrew works with points. They are ten in number: five perfect, which, with their preceding consonant, form a syllable; and five imperfect, which have a consonant preceding and following them. The names, figure, and power are shown in the following table:—

Name.	Sign.	Sound.	Name.	Sign.	Sound.
Kametz	ⱪ	a in father	Pathach	ⱥ	a in bad
Tzeri	ⱦ	a in fated	Segol	Ⱨ	e in bed
Long Chirek	ⱨ	i in machine	Short Chirek	Ⱪ	i in bid
Cholem	ⱪ	o in go	Kametz Chatuph	ⱬ	o in bot
Shurek	Ɑ	oo in droop	Kibbutz	Ɱ	u in but

There is another vowel called *Sheva* (·) which has been introduced to facilitate the utterance of words. When it is sounded, it has the power of a very short *e*; as in the word *below*. It is used alone and also in combination with Pathach, Segol, and Kametz, being placed after them thus: - ·, ·, ·. A dot over a consonant, at the left-hand side, is the letter *o*, which is then pronounced after the consonant.

There are no capitals; therefore, letters of the same shape, but of a larger body, are used at the beginning of chapters and other parts of Hebrew works.

Occasionally, also, certain words begin with a letter much larger than the body of the text; and a small letter is sometimes found in the middle of a word, as is, also, a final.

Beth.	Gimel.	Daleth. Resch.	He. Cheth.	Vau. Zain.
ב	ג	ד ר	ה ח	ו ז
ב	ג	ד	ח	ו
Caph.	Nun.	Caph final.	Tau.	Nun final.
		Teth.	Mem final.	Oyin.
		ט	ם	ע
		מ	ם	צ
		Mem.	Samech.	Tzade.

Lay of the Hebrew Case.—Each of the great houses where Hebrew work is done has its own lay of the case: that, however, given on the previous page is perhaps as common as any.

CHAPTER XXXVI.

LAW PRINTING.—Legal matter in Bookwork—Law Jobbing Work—Statements in High Court of Justice—Mode of Setting—Scale of Payment—House of Lords Printing—Parliamentary Bills—Articles of Association—Company Prospectuses—Company Reports and Balance Sheets.

THE important branch of the printing business known as Law Printing is best discussed under two heads : (1) That which is comprised under law bookwork proper, and consists of legal treatises, reports of cases (in book form), etc. ; (2) That which may be termed law jobbing work, and consists of documents used in the different courts, such as Statements of Claim, Statements of Defence, Answers to Interrogatories, Depositions, Cases, Petitions, Notices, etc. This is really only a kind of bookwork.

Law Bookwork.—The prime recommendation of a well-printed law book is the uniformity of its style throughout, that being founded on the standard books in use. This uniformity is especially to be maintained in the contractions, used in quoting authorities, which are generally very numerous ; and which, if ambiguous, might lead to confusion or error on the part of the reader.

The names of the parties to a suit are usually in italic ; but they may be in Roman. Whichever plan is adopted, it must be carried on throughout the work. The references to the volume of reports in which the case is to be found must be in Roman ; even when the names are in italic, thus : *Hadley v. Baxendale*, 9 Exch. 341.

The "authorities," *i.e.*, names of the cases with the references to the reports where they are to be found, are generally placed in footnotes ; but if the name of the case be introduced into the text, the reference alone is put in the footnote as it follows in parentheses. If the case is added parenthetically, of course the whole is enclosed within the parentheses. The following are examples of each of these styles :—

"No action lies for damages for the destruction of crops by rabbits or pigeons against the person breeding them." (a)

(a) *Cooper v. Marshall*, 1 Burr. 226 ; *Hannam v. Mockett*, 2 B. & C. 939.

"In *Wilson v. Newberry* (b) it was held, etc."

(b) L. R. 7 Q. B. 31.

"An action of this nature must be brought within the six months' limit, otherwise it will fail (*Ray v. Kesterton*, L. R. 13 Eq. 876)."

It will be observed that instead of "and" the ampersand (&) is employed in quoting the authorities, and there is no comma after the full stop between the authority and the page.

The sign & is always employed in citing the years of the reign of any monarch in which an Act of Parliament was passed ; thus, 15 & 16 Geo. 3, c. 21. The number distinguishing the king is in Arabic, because Roman characters would be more cumbersome and much less explicit.

In all instances of this sort the figures should never be separated at the end of a line from that to which they belong ; nor should the constituent parts of what forms but one portion of the reference ever be divided. Thus in the instance given above, 15 should not end a line, which would cause the next to begin with & ; neither should Geo. be separated from the accompanying 3 ; nor c. from 21. Nor in like manner, the letters denoting any office, such as

Ld. Russell, L.C.J., where the L.C. and J. should always be in the same line. So in all similar cases, for division of such parts would be both unsightly and confusing.

When two or more authorities for a statement are given consecutively, each case is separated from the one following by a semicolon. Thus: "The statute and authorities relating to this point (12 & 13 Car. 2, c. 14, s. 6; *Bell v. Bradfoot*, 6 T.R. 421; *Cooke v. Jonas*, 2 B. & A. 423) are conclusive." This is so whether the authorities are inserted in the text or in a footnote (see example on previous page).

The titles of the *authorities* are always contracted in the same form. Thus Co. Litt. is always the contraction for Coke on Littleton; Barnewall and Alderson's Reports always B. & A. As there are some hundreds of these abbreviations universally recognised, our space will not permit of reprinting them here, but they may be found in the Catalogues of Law works published by Messrs. Butterworths, of Fleet Street, and Messrs. Stevens & Sons, of Chancery Lane.

Law Jobbing Work.—This is really a branch of book-work, and is therefore treated here. It is regulated by the Judicature Acts, and the Rules of Court issued thereunder, which prescribe that certain documents *must*, and others *may* be printed. The former are:—

All pleadings (*i.e.*, Statements of Claim, Statements of Defence, Replies, etc.) not being Petitions or Summonses, of 10 folios¹ and upwards in length (Ord. xix. r. 9).

Special Cases (Ord. xxxiv. r. 3).

Answers to Interrogatories, if exceeding 10 folios, unless otherwise ordered by a judge (Ord. xxxi. r. 7).

Evidence taken by affidavit, pursuant to Order xxxviii. (Ord. xxxviii. r. 30).

¹ A folio is 72 words, every figure comprised in a column, or authorised to be used, being counted as one word (Ord. lxx. 12, 27 sub. r. 14).

The following documents *may* be printed :—

Pleadings under 10 folios in length (Ord. xix. r. 9).

All affidavits, by consent of all the parties, or if ordered by a judge (Ord. xxxviii. r. 30).

Evidence on appealing, if ordered by a judge, or if a judge of the Court of Appeal shall subsequently sanction such printing.

All these documents are invariably set in pica, and printed on foolscap sheets, made up in folio. In order to secure the proper margin (to be referred to presently), they are set to 30 ems pica. A full page is 55 to 60 ems long, and contains about 40 lines. Each page is folioed, except the first, with a figure in the middle of the line. Some printers retain the system of putting a catchword at the end of each sheet, but this is not now usual.

We have endeavoured to imitate in small type the style followed in printing a pleading, and with the following directions any compositor will be able to set one up.

With the exception of the lines "In the High Court of Justice" and "Statement of Claim," all the lines are set up in pica. The two exceptional lines are in black letter, which may vary from two-line pica to two-line great primer.

The reference number is best set in antique, and is always at the top of the page towards the right. The line of black letter begins the full measure; a rule thick side up, its exact length, is often placed below it. The next line is indented 4 ems. The line "Mr. Justice Byrne" is set in small caps. with cap. initials. It is indented one em more than the last. The "Fo. 12" and "Writ," etc., may be in the same line. The former is always at the commencement of the line, and the latter always indented so as to run out to the end of the line. The line commencing "between" is run out to the end of the measure, if the plaintiff's names and the word "plaintiff" can be got into one line; if not, then to within about eight ems of it, as in the case of the

defendants' names below. "Between" and "Plaintiff" are each in small caps. with a cap. initial. The name of the plaintiff is in capitals. The word "and," in lower case, is in the centre of the names. The indentation of the next

1900-S.-86.

In the High Court of Justice.

CHANCERY DIVISION.

MR. JUSTICE BYRNE.

Writ Issued 15th January, 1900.

FO. 12.

BETWEEN JOHN THOMAS SMITH - - - PLAINTIFF,
and
JAMES ROBINSON, EDWARD
THOMPSON and PETER
JONES - - - - - DEFENDANTS.

Statement of Claim.

1. By an agreement dated the 10th January, 1899, the plaintiff agreed with the defendants to sell, etc.

The Plaintiff claims

1. Specific performance of the agreement dated, etc.
2. Such further and other relief, etc.

H. JOYCE.

*Delivered the 2nd March, 1900, by Mr. ABEL BROWN, of
Lincoln's Inn Fields, Plaintiff's Solicitor.*

line is determined by the point whereat begins "John." Defendants', like plaintiffs' names, are invariably in caps., however many there may be. Commas should be placed between the names of the respective parties, except the last

two, which are divided by the word "and" in lower case. The words "Plaintiff" and "Defendants" in the title are always at the end of the measure, and hyphens or leaders are used to connect them with the respective names. The next line ("Statement of Claim" or "Defence," as the case may be), generally in black letter, is set to the middle of the measure. After it comes the first line of the text of the Statement.

This is set like ordinary matter, with these exceptions: No grammatical point whatever, except the period, is inserted, unless so marked in the manuscript. The compositor will therefore refrain from putting in commas, semicolons, or colons, except where marked in his copy. The parenthesis may be used, when distinctly marked by the author. Phrases may be quoted (with double points) if so marked in the copy.

Dates are printed thus: 1st July 1875 or 1st day of September 1860, not in words.¹

Sums of Money are printed thus: £58,856 18s. 11d. or £277 8s. 7d., not in words.

No *contractions* whatever are to be used; names especially must be set out in full, even if in the copy initials only be sometimes written.

Each paragraph is numbered, with an Arabic figure indented 2 ems. A period is put after it, and the text commences as usual with a capital letter. Each paragraph is divided by a white line from the preceding one. There is a white line after the folio head line also.

Quotations, such as extracts from indentures, if they make more than one line, have double turned commas at the beginning of all the succeeding lines up to the last, when the usual double apostrophes are placed at the end of the sentence. The quoted portion is sometimes indented

¹ So ordered by the Rules of the Supreme Court, 1883 (Ord. xix. r. 4).

an em or two at the beginning of the lines, instead of having the inverted commas; the compositor must ascertain for himself the particular style followed in the house where he is employed.

At the end of the job comes the "claim," thus:—

The Plaintiff claims

1. Specific performance of the agreement dated, etc.
2. Such further and other relief, etc.

Here it will be seen that the first line is indented 4 ems from the body of the work, and the second line 4 ems more, *i.e.*, 8 ems, while the third line is still further indented.

Then, in some Statements of Claim, follow the words "Place of Trial, Oxford," or as the case may be. These begin at the commencement of the measure, without indentation.

At the end of the pleading comes the signature of Counsel. This is set in caps, and is run out to the end of the line.

Then, after a white interval, the note of the date of delivery and, if in the copy, the name and address of the solicitor. These lines are centred, and are preferably set in italic, the name of the solicitor being in small caps.

Every pleading, and nearly every other document printed in an action, commences with the "title of the action," as shown in the foregoing example. When there are several plaintiffs or defendants, a comma should be placed between the names of those which are not separated by the word "and" (*vide* example).

The style thus detailed is founded on that generally adopted in the old Chancery Bills and Answers, modified and fixed by the following directions, extracted from the Rules of the Supreme Court, 1883, to which printers must carefully conform:—

Order lxvi., rule 3. "Proceedings required to be printed, shall be printed on cream wove machine drawing¹ foolscap folio paper, 19 lb. per mill ream,² or thereabouts, in pica type, leaded, with an inner margin about $\frac{3}{4}$ inch wide, and an outer margin about $2\frac{1}{2}$ inches wide."

The margins prescribed are not in practice strictly adhered to; so long as good broad margins are left, no complaint is made. For reasons suggested by the system of payment adopted for the work, as will be presently noticed, a narrow or condensed pica is most advantageous to the printer, as he gets more into a page, and may sometimes save paper and making up. Any style of pica may be used, even old style. The leads used should be 4-to-pica, but thinner ones are not objected to when thick leads would drive the matter out on to another page.

Folios.—By the Rules of the Supreme Court, 1883, Order lxvi., rule 7 (*m*), it is directed that "The folios of all printed and written office copies, and copies delivered or furnished to a party, shall be numbered consecutively in the margin thereof." The word "folios" here does not mean page, but a collection of 72 words, which is a law writer's "folio."

The rule is not strictly adhered to; it is useful only where the paragraphs are so long that the position of any passage may best be fixed by reference to the figures in the margin, but otherwise these figures are not only of no use, but simply confusing.

¹ Drawing foolscap is not, as might be supposed, a kind of paper for drawing on, but a thick cream-wove paper of the best quality and colour, very clean, and intensely hard-sized. It should measure $16\frac{3}{4}$ by $30\frac{1}{4}$ inches, and is known in the trade as "law foolscap."

² A ream of writing paper as it comes from the mill contains 18 quires of 24 good sheets, and 2 quires of 20 sheets of outsides, that is, damaged paper; 472 sheets in all, good and bad—this is called a *mill ream*.

The Endorse.—On the back of the last sheet is printed the “endorse,” of which the following is a specimen :—

1900. S. 86.

In the High Court of Justice.

CHANCERY DIVISION.

MR. JUSTICE BYRNE.

Fos. 15.

SMITH

vs.

ROBINSON.

Statement of Claim.

ABEL BROWN,
Lincoln's Inn,
Plaintiff's Solicitor.

Imprint.

It acts as a kind of title page and occupies the right half of the fourth page of the sheet (that nearest the fold). It is set to a measure of 21 or 22 ems. The top line (“1900, etc.”) and the last line (“Plaintiff’s Solicitor”) are run out to the end of the measure. The only lines which are not indented are “In the High Court, etc.,” and “Fos. 15;” the name of the cause and the line “Statement of Claim” (or “Defence”) are centred.

Special Cases, Affidavits, Answers to Interrogatories, etc., are printed in the same style and on the same kind of paper as Statements of Claim.

Writs and common forms are printed with blanks for the names to be filled in. We need not copy these to show the style, as they may be bought for a few pence at any of the law stationers'. They are printed in the same style and on the same kind of paper as pleadings, but the Notices endorsed are sometimes in bourgeois or brevier, instead of pica—they would otherwise occupy too much space.

Allowances for Law Printing.—By the Rules of the Supreme Court, certain specified allowances are made for printing. The result is that solicitors and suitors obtain such allowances and no more. Printers are not bound to do the work at the price for their customers, and the rates being in some cases unremunerative, they have frequently objected to do so. Generally, however, they consent to take these prices. The charges allowed are these :—

s. d.

“For printing, the amount actually and properly paid to the printer, not exceeding per folio¹ .. 1 0

“And, in addition, for every 20 copies beyond the first 20 copies, @ per folio¹..... 0 1

“And when any part shall properly be printed in a foreign language or as a *facsimile*, or in any unusual or special manner, or where any alteration in the document being printed becomes necessary after the first proof, such further allowance shall be made as the taxing officer shall think reasonable.”

Some printers allege that the terms allowed by the Rules do not cover the endorse, and they have attempted to rectify the poverty of the specified payment by charging unusual prices for this page. Others have attempted to charge their customers extra for author's proofs, tabular matter, folioing, and nightwork. With the exception of author's corrections, which are charged *ad valorem*, it is not usual to charge these extras, but to abide by the specified scale.

¹ Of 72 words.

House of Lords Printing.—There are some peculiarities in the printing for the highest Court of Appeal which ought to be referred to here.

The *size* of the paper is quarto, the dimensions of a page being about $8\frac{1}{2}$ by $7\frac{1}{2}$ inches. The margin is large, the measure to which the matter is set being 30 ems for the case itself, and the same for the Appendices. The case is generally printed in "English" type, and in the outer margin, against the first line of each page, and against every sixth line, is a cap. letter of the alphabet, A, B, C, etc.

Quoted documents are in smaller type; the documents in the appendices are in small pica or long primer; the marginal notes in brevier or bourgeois. In regard to the size of the type and the quality of the paper, the House has issued no special directions.

We extract from the "Standing Orders and Methods of Procedure," under the Act of 1876, the following :—

"The Appeal is to be printed on parchment (quarto size) in such form as will allow paper copies thereof to be bound up with the printed cases."

"The Appeal and Appendix must be printed quarto size with seven or eight letters in the margin for facilitating reference, and should be submitted in proof to the Clerks in the Judicial Office."

"Where reference is made to a document printed in the Appendix, the case must contain a marginal note of the page of the Appendix containing such document."

In Appendix B to these Standing Orders are given directions for binding printed Cases, for the use of the Law Lords, as follows :—

1. Ten copies are to be bound in purple cloth, two of the ten to be interleaved, as far as the cases only.
2. The Short Title of the cause must be impressed on the back.
3. There must be a label on the side stating the short title of the

cause and the contents of the volume; thus, "A. & others *v.* B. & others.

"Printed copy of the Appeal
"Appellants' Case
"Respondent B's Case
"Respondent C's Case
"Appendix "

4. The volume is to be indented (or cut ledger-index fashion), and the names of the parties marked on the indentation to their respective cases.

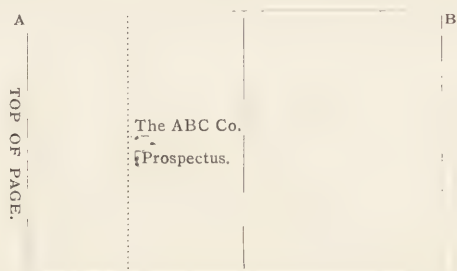
Parliamentary Bills are printed in pica leaded to the same measure and in the same style as Statements of Claim. They, however, always have down the margin nearest the back at the end of every fifth line a pica figure denoting the number of the line. They are printed on a peculiar light blue or grey paper.

Company Memoranda and Articles of Association are printed in pica leaded and endorsed just like Statements of Claim, and they are usually printed on the same kind of paper as these.

Company Prospectuses.—These partake largely of the character of law jobbing work, though nowadays there is often on the first page a certain amount of display, the leading features of the undertaking being brought out prominently in different sizes and kinds of type. The rest of the work is generally plainly set in pica, with perhaps here and there a few words underlined with turned rule or thrown up in antique or sanseriff. For this work demy paper is generally used, the page being of demy folio size.

The endorse is set to occupy one-fourth of the fourth or eighth page, but unlike the endorse of a Statement of Claim or other law paper it reads from fold to fore-edge, the head line of it being always nearest the fold. The measure is about 21 ems. The name of the company is set in titling caps. or sanseriff, and is placed about 12 or 15 ems from the head (*i.e.*, from the fold). The word "Prospectus" is

usually set in a heavy black or other bold job type spaced in the centre, and is often placed between full width double rules. The imprint is in brevier or nonpareil lower case or light Roman caps half an inch or so from the bottom (*i.e.*, the fore-edge). Such an endorse is imposed thus:—



If a half sheet of demy be folded into four the endorse should fall on the second quarter, beginning at the top of the page as shown in the diagram. The line A B represents the fold of the sheet.

Company Reports, Balance Sheets, etc.—These are commonly printed on foolscap, the page being generally folio size. Demy is, however, sometimes used, and then the page may be either folio or quarto size according to the quantity of matter. The size of the type used varies with the quantity of matter. Black letter or plain job type is effective for headings. The endorse is set as before described, and if the size of the page be foolscap folio or demy folio it occupies the space and is imposed as last described; if, however, the page be quarto size the endorse is imposed so as to occupy the last half of the fourth or eighth side as in a Statement of Claim. For foolscap the measure of the endorse is 18 ems.

CHAPTER XXXVII.

NEWSWORK.—Requirements in the Compositor—Setting Advertisements—Practice of Weekly and of Daily Journals.

WE now approach the second of the three divisions into which printing, as at present carried on, has been divided—Newswork.

Composition for newspapers has undergone a great change during the past few years, movable types and hand-setting having been superseded very largely by the invention of a remarkable machine called the Linotype, which is so constructed that the operator, by playing upon keys somewhat as a pianist does, sets up, not type, but brass matrices, until they form a line, when molten type-metal is injected into them and there comes forth a solid line of type (hence the name of the machine), cast with perfect truth to the body designed and of the exact measure fixed upon. In this way with great rapidity line succeeds line until a galleyful is obtained. If there is any mistake the whole line in which it occurs must be reset and recast, and over-running has to be done in lines instead of in words only; yet neither this drawback nor that of the expense of the machine, which is very costly, hinders the linotype from being far quicker and more economical than the old method. There are, therefore, now a great many daily newspapers of which at least the literary matter, or some portion of it, is set by means of these machines; while in some offices, the *Daily News* being an instance, every part of the paper except the displayed advertisements is set on them. The machines are more often than not worked by men who have

passed through an apprenticeship to the trade of a compositor by hand, and who had had the foresight to learn to operate the instrument which seemed destined to supplant them. Indeed, the linotype operator needs almost all the qualifications of a good news compositor by hand. What these qualifications are we will now state, prefacing our remarks by the reminder that though the linotype is generally found in a modern daily newspaper office, there are still very many weekly papers, and not a few dailies—some of the most important being among them—in which composition is still done by hand.

Speaking generally, it may be stated that any compositor who is able to set up plain straightforward matter may attempt newswork. He should, however, know how to compose tables, although he may but seldom be called upon to exercise his knowledge. Beyond these two qualifications are several special ones that are requisite.

It is absolutely necessary that the news hand should be a quick and a clean compositor. This is called for in the first place by the nature of the work, which has to be done with the utmost possible expedition. In the second place, newspapers are set up on a plan peculiar to that kind of work. It is frequently of the greatest importance to be able to get a proof of an article within a few minutes of the time at which it is given out. A leading article, for example, may require to be completely put in type in a quarter of an hour. The quantity of setting in it would occupy any one man at least five hours. The copy is consequently cut up into pieces, numbered consecutively, and divided among twenty or more men.

Collectively, they complete it within the fifteen minutes allowed. They each take a portion—which is shortly called a "take"—set it up in their sticks, and empty in due order on a galley, as indicated by the numbers written on the respective portions by the overseer.

The division of copy into "takes" is often necessary where the linotype is used, two or more machines being put on to the same article or speech, only the takes are longer than when the work is done by hand.

Accordingly, an average rate of dexterity has to be acquired by each news hand, otherwise he would lag behind his fellows and delay the execution of the whole. For the same reason of expedition, he must be a clean compositor. If incompetent or slovenly, his proof will exhibit an undue number of errors. These detain the reader unnecessarily, and occupy time in rectification in the metal. Indeed, a slow or a "dirty"¹ compositor is altogether out of place on a newspaper, and seldom long retains his situation. The suggestions in a previous chapter on habits to be acquired, habits to be avoided or reformed, and how to become a good compositor, are especially applicable to newswork.

There are several other qualifications that are most essential. The news hand must be able to read bad copy with ease. Editors and reporters frequently write a wretchedly bad hand, and nearly always have to write under high pressure. Some of the copy given out to the compositor would appear almost undecipherable. The news hand is required to read it accurately at a glance. He must also punctuate it as he goes along, and without stopping to think. Further than this, he ought to have a good general knowledge of current topics, as it will aid in many difficulties, and prevent many errors in reading copy. Attention ought to be paid to the spelling of proper names of persons and places most frequently referred to. It is seldom that names are so carefully written that each of the component letters is distinguishable. The compositor judges by the general appearance of the word as to what is intended, and supplies the spelling from his own knowledge. Every item of in-

¹ A "dirty" compositor is one who makes many mistakes.

formation a man may acquire will almost certainly be found useful to him in some emergency during his experience as a news hand. Hence, he should be a reading man, especially of newspapers; and the more he knows of men, things, and books the more are his qualifications for efficiently carrying on his business—and, to some extent, the more money will he earn.

Capitalisation, etc.—It is very necessary, too, that the news hand should be well acquainted with “the style of the house” in regard to such matters as capitalising and the formation of compound words. As to the latter, there may be many deviations from the rules already stated in Chapter XVI., *ante*. In regard to capitalising—technically speaking, “keeping-up” words—the following is a specimen code of rules used in some large provincial news offices. It may suggest some of the chief points as to which the compositor should inform himself when undertaking work in an office.

Titles given to royal personages either by right or courtesy to be kept up; for instance, “his Majesty,” “his Highness,” etc.

The titles of Church dignitaries and members of the Government to be kept up when such titles are given in full, as “the Archbishop of Canterbury,” “the Rector of St. Mary’s.” But should they be referred to as “the archbishop,” “his lordship,” “the rector,” etc., they should be kept down.

The full titles of the heads of corporate bodies, such as the Lord Mayor of London, the Lord Provost of Edinburgh, etc., to be kept up; but when spoken of simply as the “lord mayor,” “the provost,” etc., the town or city of which he is head being omitted—to be kept down.¹

Whenever the full and correct title of a public body is given, the same to be kept up; for instance, “the Thames Conservancy Board,” “the Board of Works,” “the Academy of Music,” “the House of Lords,” etc., but down when such is referred to as “the board,” “the council,” “the academy,” “the house,” etc.¹

The correct titles of all the law courts to be kept up; for instance, “the Supreme Court of Judicature,” “the High Court of Justice,” “the

¹ In London and many other newspaper offices it is usual to keep up what according to these rules should be kept down.

Queen's Bench Division," "the Bankruptcy Court," etc.; but when referred to as "the court," without giving its title, the word "court" to be kept down.¹ The latter rule to be observed when the word "sessions," "assizes," etc., occurs, preceded by the article "the."

The full titles of lectures, etc., to be quoted and kept up—such as, a lecture on "The Discovery of Prehistoric Remains in Sussex."

The several departments of the Government and the army and navy to be kept up—such as the Admiralty, the Board of Trade, the Horse Guards, etc.; also the word Volunteers when used as a proper noun. The word Act to be kept up only when the title is given in full, as the "Public Works Act." The word Government to be kept up when used as a proper noun.

In newspaper work "street," "road," etc., in proper names are usually kept down, and a hyphen placed before them, as Fleet-street, Ludgate-hill, etc. The punctuation is generally looser—that is, the points are less frequently used—than in bookwork.

Attention should be paid to the style of the house in regard to cross-heads, whether they are in caps, caps. and small caps., or "even smalls," that is, entirely in small caps.; to the indentation of paragraphs, and the manner in which side-heads are set; the way head-lines are set, and whether they are followed by a dash line.² A careful study should be made of the typographical peculiarities of a copy of the newspaper itself.

Abbreviations.—Reporters use various abbreviations, which should be understood. Among these are xd for examined, xxd for cross-examined, in law reports; / for the; t for that; o for of; w for with; f for for; fm for from; wh for which; d for the affix ed; g for ing. The meaning of these should be sufficiently obvious to an intelligent compositor.

¹ See note on preceding page.

² One of the London morning papers introduced the plan of giving as a heading to the leaders the title set up as a "cut-in note." This has been followed in different parts of the country, and sometimes supersedes cross-headings.

Making Even.—The process of division into "takes" involves one important operation, called "making-even." Whenever possible, the overseer so cuts up the copy that the portion ends with a break, as at the close of a paragraph. This, however, is comparatively seldom practicable, and the compositor finds that the last line in his stick is an incomplete one. He is allowed to justify by putting greater space between the words. In some cases an em quad may be used, and yet the line will not be long enough. He must then over-run part of the previous line, if necessary also using quadrats, till he can "end even" with a full line. Any one taking up an ordinary newspaper can usually note the length of the "takes" in any particular article by the unusually wide spacing which recurs at intervals.

Advertisements.—In some newspaper offices the advertisements are set up by a separate staff of compositors, who work independently of the others, and supply full pages of advertisements direct to the stereo foundry, and advertisements intended to come on a page with literary matter on it to the maker-up of the latter.

Advertisements are composed in two different styles, known as "run on" and "displayed." A *run-on* advertisement is set like a common paragraph, except that it is begun with a 2-line letter, which usually occupies the depth of the first and second lines, that the first line is set up in a larger type than the body, and that part of this line is in capitals. Other parts, to which particular attention is desired, are also set up in capitals. In regard to this kind of advertisement no special instructions are needed. The compositor must remember that capitals must always follow the 2-line letter, but he must conform to the *style* of the house in regard to the extent to which capitalising is carried. Practice varies much in reference to this point. Initials which correspond in body to two lines of the type used are called "drop letters." The first line may be in bourgeois,

and the rest of the advertisement in minion, or brevier and nonpareil. They will be prescribed by the style of the paper. If an initial letter in the first line is made to stand up by being justified at the *bottom* of the face instead of at the top, it is said to be a "cock-up" letter.

"Displayed" advertisements are those in which the matter is spread out into a number of lines, so disposed as to give them unusual prominence. Several sizes of Roman type may be used. No directions can be given on this subject, as nearly every paper that permits such advertisements has its own special regulations. In some cases jobbing or fancy types are allowed to be used. The composition of such advertisements really belongs to job work.

Special news figures and fractions are now supplied by the foundry. They are, in proportion to their body, extra distinct, partaking of the nature of "skeletons." The figures and fractions are properly cast to en thickness, and have a nick at the back like small caps. Sloping fractions, however, are cast to the em body.

For the purpose of distinguishing the respective composition of the different hands, brass "galley slugs" are now made, on long primer or pica bodies. They are like very wide rules, thick side up, and on each is cast a letter or figure. They are of the width of the column, and being dropped in, print with the matter, obviating the necessity of the reader marking the proof with the name of the compositor. Of course they are removed when the matter is made up.

Weekly Newspaper Work.—A few more of the peculiarities of news work will be exemplified in the following outline of the manner adopted for setting up a weekly paper of the *Spectator* or *Saturday Review* class, consisting of twenty or thirty pages, each of which contains two wide columns; except the advertisement pages, which are set to a narrower measure, and usually contain three columns, or

one double column and one single. We must pass over the literary and editorial part of the staff. The former may consist of regular contributors, reporters, and the leader-writers; the latter of the editor, who decides upon the articles that are to be inserted; and the sub-editor, who compiles the miscellaneous columns, selects the "padding,"¹ and carefully reads over the whole paper, partly to see that nothing is inserted that is inconsistent with the policy of the paper, and partly in order that nothing may be inserted twice over, or in a form that is opposed to the general make-up of the journal. The editor and sub-editor supply the printing office with the "copy," which usually is marked at the head with the name of the type in which it is to be composed, and generally at the end is placed the name of the contributor, or a mark settling his identity, in order that he may be known subsequently should such be necessary. The sub-editor also marks the copy with the heading under which the matter is to appear in the paper, such as "Home," "Foreign," "Miscellaneous," etc. With these indications upon it the copy comes into the printing office.

A newspaper office is generally superintended by an overseer, who is called "the printer." It is he who is called upon to meet the editor or sub-editor, afford them explanations and information of the state of the work, and receive the instructions which his subordinates are expected to follow. The printer is responsible for the safe custody and due return of the copy, for getting the paper to press in time, and is called upon to check the accounts of the compositors, to make up the bill for the work as a whole, and sometimes to pay the hands individually. He must be a man of perfect steadiness, judgment, coolness, and

¹ Matter inserted rather to make up quantity than by reason of its merit is called "padding."

decisiveness; and although he does not set himself, he should know all about the work, and be able to take a share in it on an emergency. The printer of a weekly paper will get from 50s. to 60s. per week; while some printers of dailies get £6 to £8 a week.

The description which follows assumes that the office is one in which all the composition is done by hand, but there would be very little difference in the routine if setting machines or linotypes were used.

When the copy arrives, it is taken in hand by the printer, who first of all divides it into "takes" or short portions, distributing these amongst the various compositors. A take usually consists of a little more than a stickful of matter, but it varies sometimes; for if a new paragraph occurs it is not overlooked. These takes are carefully numbered, and a list is kept of the compositors who take the several pieces. It is not usual to select the matter for any man, and each receives what copy is uppermost on the printer's desk; but if there is any "fat"¹ which occurs regularly, it is given out to different men in rotation, as far as possible. This is especially the case where there is a column such as poetry, which goes in every week.

The compositor who has the first take of any article is expected to get out a galley for his own and his successors' matter. At the head a "direction line" is placed. This is set up in type, and is pulled along with the matter up to the time when that is made up into the forme, but it is then left out. It is a line indicating as concisely as possible the section of the journal under which the matter is to appear—as "Home," "Foreign," "Colonial," etc., and is chiefly a guide to the maker-up. If an article extends over a galley, a second

¹ "Fat" is copy on which, by reason of whites, etc., the compositor can earn his money easily. Solid setting, on the contrary, is said to be "lean."

but shortened direction line must be inserted at the head of the second galley. For these lines compositors do not charge ; hence they are generally kept standing if possible. Besides the subject of the matter, the direction line should indicate the number of the galley, if there is more than one galley devoted to that kind of matter, as " Home 1," " Home 2," " Home 3," and so on. It will sometimes happen that a variety of short takes belonging to different sections have to be laid down on one galley. In such a case each will have its own proper direction line.

As each man finishes his portion of copy he empties his matter on the proper galley, in correct order. Thus, if he who has No. 5 piece finds that No. 4 is not on the galley, he leaves a space for it. The man who has the last piece of copy, or he whose take fills the galley, pushes up all the matter close together, and then puts a sidestick to it and locks it up. The pulling or proving of the galleys (which is done at a galley press) is undertaken by the different compositors in rotation, and it is the duty of the compositor who locks up the galley to ascertain " who is in the pull," *i.e.*, whose turn it is to pull it, the turn being kept in rotation by means of a piece of wood furniture, with the word " pull " plainly printed on it, being passed from one to the other round the 'ship. Two proofs are pulled—one to go to the reader, the other to be retained by the printer.

Every compositor is required, under a penalty for neglect, which is rigorously enforced, to write his name on the piece of copy which he composes, unless name-slugs are used. These pieces of copy, after the take is finished and emptied on the galley, are spiked, or stuck on a special nail on the random or wall numbered to agree with the galley number. The compositor who pulls the galley has to collect these different pieces of copy and arrange them in order. He must be sure that no pieces are missing ; if any are not to be found, immediate notice must be given to the overseer.

He then rolls up the copy inside the proof (writing his name on the latter, at the bottom, in pencil), and places the bundle in some place near the printer's desk which has been previously arranged for, and whence it will be carried by the reading boy to the closet in order to be read.

The reader not only marks all the errors in the proof that he may discern, but writes on it the names of the different compositors who have set the matter, indicating exactly where each began and left off. Having signed the proof, *i.e.*, written at the top of the matter his initials, the date, and the word "First," he sends it to the compositor whose name appears first in order, and this compositor does his own corrections, and then passes on the proof to the man who is next in order. In this way each man corrects his own matter. If, however, there are only three marks or less, there is "no pass"—that is to say, the compositor who has the galley does them, instead of passing it on to the one who sets up the matter. The reader meanwhile keeps the several pieces of copy.

When all the galley is corrected, two more proofs, called "revises," are pulled—one for the editor, the other for the printer. If the contributor or author also has to read the matter, it involves the pulling of a third revise. To distinguish the revises from first proofs, the reader marks on the head of them in ink the letter R.

The galleys of matter are kept on shelves or in racks, which are generally labelled with the kind of matter that is to be laid down there—whether "Home," "Foreign," "Colonial," etc. This is done in order that the maker-up may know, without searching, where each kind of matter is to be found. On a separate galley are kept all the headlines which stand from week to week, duly arranged in order. The dates are all altered together, as are the folios, before the pages are made up. This is a most important regulation, for there is nothing so easy, and few things more annoying

than to have a wrong line, date, or folio at the head of a page. The galley containing the head-lines should be pulled as though it were new matter, and the correctness of the date and the sequence of the folios carefully scrutinised. In this way time is saved and danger of mistakes minimised.

When there are many standing lines in a paper, they also may be kept on one galley, specially reserved for that purpose. They should be arranged in proper alphabetical order.

The revises are sent by the reader to the printer, and by him given to the men to be corrected, after which clean proofs are pulled and forwarded to the editor or sub-editor. In some offices a bag is provided for the messenger, and there are two keys for it, one being kept by the printer, the other by the editor, or some one authorised by him. The messenger receives the bag locked, and so delivers it to the proper recipient, and returns the bag in a similar condition; and thus all chances of the copy or proofs being tampered with are avoided.

As soon as the editor has returned his revises, and specified the contents of the forthcoming number, "making-up" is proceeded with. It is customary for the printer to supply the editor with a statement of the matter composed, showing the titles of the different articles and the space they will occupy, in columns, and eighths, or fourths, and the editor marks on this the articles that he desires to appear; otherwise the return of a proof duly corrected and initialled by the editor is a sufficient authority to the printer to include such matter in the make-up. Whatever alterations or corrections are marked in the editor's proofs are done in the galley before the matter is made up into pages. If these marks are very heavy, or involve much over-running, or include much new matter, it is best to have another revise pulled, and compared with the editor's proof by the reader.

Making-up is done by certain selected men who are either

very quick at that operation or have had long experience of the paper and its arrangement. Each page is tied up and taken to the proof-press, where it is pulled in duplicate, the matter being then transferred to the imposing stone. It is usual for the editor or sub-editor to read the pages, and important alterations are sometimes made at this stage. In any case the pages are finally "read for press" by the reader. This reading includes both "tracing" and "revising," that is to say, examining that all the different "takes" and galleys are properly made up, and ascertaining that nothing is omitted or misplaced, and also examining whether all the editor's or authors' marks on the galley slips have been duly attended to. The reader further observes whether the head-lines, dates, folios, etc., are correctly placed; and whether there are any glaring blemishes of workmanship, such as wrong division rules, bad spacing between articles and paragraphs, etc. The proofs of the pages are then given to the printer, who has all the marks attended to. The pages are now imposed, locked up, and sent to press. In some offices there is a machine reviser, who gives the whole paper a comprehensive "look over" before the impression is actually worked off.

A journal of the kind indicated is, in London, generally printed off on Thursday night or very early on Friday morning, in order that copies may be supplied to the trade about the afternoon of the same day, and that the country dealers may have them by Saturday morning. The hours of working are arranged as follows: On Monday the compositors are engaged in distributing: getting their cases filled for the work which is to come. If there are any proofs to "go out," that is, to be sent to the authors or editor that evening, the copy is given out and composed, otherwise no copy is taken up this day. On Tuesday the work of composition begins in earnest, and on Wednesday it is continued. On this second day as much as possible is

got up, and the men stay an hour or two overtime for that purpose. Thursday is the great day, and that on which the "rush" of work happens. Sometimes only a quarter of an hour is allowed for dinner, and the same for tea. The work, of course, goes on until it is finished, and composition is sometimes continued until one or two o'clock on Friday morning. As a rule, however, this is avoided. About tea-time on Thursday evening the making-up of the pages is begun. This work is done "on time," that is to say, the compositors are not paid at piece prices, but by the hour. The authors' and editor's corrections, alterations, etc., are also done on time, as they could not be charged in any other way.

Daily Newspaper Work.—The system of getting up a large morning paper differs little in the main from that appertaining to a weekly. What chiefly distinguishes the work, however, is the "rush" with which nearly everything is done.

The number of persons engaged in bringing out an ordinary eight-page daily paper is really astonishing to the uninitiated. There are, for instance, the manager, the editor-in-chief, the sub-editor and his assistants, leader-writers, foreign correspondents (resident and special, as many as twenty or more), critics (music, art, and drama), reporters (Parliamentary, police court, sporting, and others), advertisement manager, canvassers, and clerks, publisher and assistants (packers, folders, counters, etc.), printer (head of the composing department), readers and copy-holders, linotypers, compositors, foundrymen (stereotypers), proof-puller, machine-minders and boys, engineers, messengers, and others—totalling up three hundred men or more, and this without reckoning the host of casual reporters, or "penny-a-liners."

The number of compositors, including linotypers, engaged on a morning paper differs, of course, with the size

of the journal, and with the number of linotypes or composing machines employed, for one of these machines will do the work of several hand compositors. There are, however, seldom fewer than fifty, and in some of the great newspaper offices in which setting machines are not yet used—*e.g.*, the *Standard*—the number is nearer a hundred. "Copy" time also differs in the various offices, in some the hour being fixed at half-past five, and in others as late as seven. Very few descriptions of type are used in a daily newspaper, those usually employed being bourgeois (lead) for leaders, special articles, foreign telegrams, and similar important news; minion for general news, such as Parliamentary debates, reports of meetings, police courts, etc.; nonpareil or ruby for sporting, markets, shipping, etc.; and ruby for advertisements.

When "Copy!" is called each man in his turn goes to the stone for his take, and when this is finished, practically the same routine is gone through as that described in the weekly paper portion of this chapter. The "copy" is thrown indiscriminately into a receptacle, whence it is frequently gathered by a lad who superintends the "copy-board." This youth arranges the copy according to folios, keeping, of course, each article separate; and when the proof is pulled it is his duty to cut the pull in halves, place the exact amount of copy in each half, and let the readers have the matter.

The first copy usually given out is the advertisements, for the "ad." pages are those which go first into the foundry. When these are all set, then anything that is "going" is given out, such as leaders, pars., shipping, and, in fact, any general news. It is always the printer's aim to get as much as possible "up" in the early part of the night, to be prepared for contingencies; for upon a morning paper it is always the unexpected that happens. The "ads." are made up in a room specially set apart for the purpose, and over-

seered by the "advertisement printer." Here the "good ads." are kept standing in galleys and on randoms, to the extent of hundreds of columns. The printer here has a deputy and several assistants, who make the needful alterations in the standing "ads." The first advertisement page, that with the title in it, is due in the foundry about twelve o'clock; the next, the back page, about half an hour later; while the third is ready for casting about one. This page may be all "ads.," or a mixture of "ads." and news; but it is usually the former. The first news page reaches the foundry, which is always only a short remove from the composing room, shortly after one o'clock, and the others follow in more or less quick succession until the whole are cast.

In the early part of the night matters are pretty quiet, and all goes along smoothly. Indeed, strangers, who know nothing of the business, have been heard to remark how wonderful it is that such a large body of men can do their work with so little noise. The time for "rush," however, comes with the "small hours." Often one or more great statesmen will be addressing meetings in different parts of the country, and their lengthy speeches are telegraphed up to London, coming into the editorial department from the post office in single folios. These are hastily sub-edited, "boiled down" if necessary, and hurried into the composing room. Here the copy is given out in short takes—takes of three lines, and make even, have occurred, though this is a rare event—and is "rushed" up by the compositors. The man who is "in the opening," that is, prevents the galley from being pulled owing to his take not being dropped, has little peace of mind till his matter is on the galley. "Printers," with the dread of losing the newspaper trains (which wait for no man), and perhaps a hauling over the coals by the manager, occasionally say things which in less excited moments they would never dream of. Indeed, the writer

of these lines knows more than one printer who, until worked up to boiling point by, perhaps, backward sub-editors, dilatory "comps.," and, more than all, the advancing hour, are among the most gentle-mannered, kind-hearted, and best-natured of men. The paper to press, however, your excited printer will wash his face and hands, and the same soap and water will clear away all remnants of his previous bad temper.

Now, a compositor, say, takes the first side of an article. The printer tells him the type it is to be set in, and he will pass it on in this fashion. The compositor who takes folio 2 calls out "No. 1?" The man who has this take answers "Here! Fashions, bourgeois." If folio 2 does not commence a break the man who has that take calls out to him who has No. 1, "End even!" This system of signalling goes on through the article.

When sufficient matter has been dropped to make a pull, the printer or his deputy calls out "Galley to pull!" and the man who is "next in pull" answers, "Coming up, sir!" leaves his frame for the random, places a sidestick, quoins up the galley, and delivers it to the proof-puller, who takes impressions for the reader, and, in some offices, for the sub-editors, though this system of letting the editors have "rough" proofs is a decided mistake. When the galley is given to the proof-puller the compositor then has nothing more to do with it till the proof comes out from the reading department. The man whose name is first on the proof finds the galley and corrects his take, and also his neighbour's take if there are not more than three literals in it, but if the errors exceed this number he then passes it on to the man who set the second take, and so on. Should it be late in the morning, he is helped in the correction by one or more of the "stone hands," or men on time. The salary of a "printer" ranges from £5 per week; and the wages of a swift compositor or a linotyper, during a busy

week, will reach £4 and over. The time hands' wages average about £4.

The number of readers, as of compositors, differs in many offices. An eight-page paper usually necessitates the services of seven readers, a first-proof reviser, and a press reviser. The more readers there are in an office the more correct, of course, the paper goes to press. It is a mistake to "starve" the reading department. Where a reading staff is small, there is time for only one reading; and occasionally, when time presses, a skim for literals and to "see that it reads" is all that can be done. Sometimes, for the country edition—although this is very rare—matter is made up only partially corrected. The professional reader of these lines may raise his eyebrows at this; but were he in the position of printer of a morning paper, with his responsibilities, he would do exactly the same. The readers commence their work usually half an hour after the compositors have taken copy, and finish with that day's issue, as a rule, about half-past two. Often "ads." are sent in for proofs prior to insertion, and these are put into type when the composition for that day's paper is completed. Upon some papers the readers are permitted to alter a palpably wrong sentence; this alteration they "ring," *i.e.*, they enclose the mark in a circular line, and the compositor correcting the galley charges at the rate of three lines for a "ringer"—though not for each one. If "ringers" are many, the corrector charges so many lines' "time." Upon other papers the rule is for the reader to follow copy, and "query" to the editor or the sub-editor. The copy-holders to morning paper readers are men, not boys. When the compositor has corrected the reader's marks, a revise is pulled and sent in to the reviser. On leaving the latter official it is taken into the composing room, and what marks are upon it are attended to. Often these have to be altered in the forme, which is already made up.

The page being made up, it is sent into the foundry. Here a mould is taken, from which the plates—shaped in a half-circle for the rotary machines—are cast, which, when they have gone through the processes of picking, trimming, chipping, etc., are lowered into the machine room. Here, as soon as each machine has its complete set, the striker is pulled, and instantly the completely printed papers begin to descend the tapes at the rate of more than 200 a minute. The early morning newspaper trains start from the various termini at about five o'clock, and in order that these trains may be caught it is essential that the last forme should be in the foundry and cast by a little after three, so that one or more of the machines may start at 3.15. The casting of a plate takes an incredibly short time. Instances are frequent when only ten minutes have elapsed from the receipt of the forme in the foundry to the placing of the plate on the machine.

The paper from which the journals are printed is wound upon a reel, and is one continuous sheet of from five to seven miles in length, and averaging about six hundred-weight. This reel is attached to one end of the machine and unrolls itself as the press revolves. Folding mechanism is an adjunct to the presses in most offices, with, in addition, automatic counters; and these effect a considerable saving of labour. The counters shift backwards or forwards every time a quire has come from the machine; hence any person requiring that number of papers can pick them up without the need of counting.

So soon as one or more of the machines have commenced printing, the papers are removed and taken into a part of the building where lads place them in wrappers for posting, as the mail bags must be deposited at the General Post Office by 4.15 A.M. When a sufficient number has been supplied for postal purposes—and by this time all the machines are hard at work—piles of the papers are carried

into the publishing office, where they are tied up in bundles of a certain number of quires for the large wholesale agents, such as Messrs. W. H. Smith & Son, who in their turn supply miscellaneous parcels of newspapers to the country shopkeepers, which parcels go by the early morning trains. At five o'clock, or a little later, the general publishing begins.

Although the methods above described appertain chiefly to one particular office, the specification of which is not necessary, only in few particulars do they differ from those in vogue at other morning paper offices.

CHAPTER XXXVIII.

JOB WORK COMPOSITION.¹—Its Importance—Classification of Jobs—
Two Sub-divisions or Classes of Work—Ordinary or Commercial
and Artistic.

THE job work section of the Art of Printing is now considered as the most important from the compositor's point of view. Newspaper and also some classes of book composition can be successfully achieved by mechanical operation; but job work, with its many measures, types, and ornaments, and varied nature, provides scope for taste, good judgment, and craft proficiency; for these mechanism has hitherto not supplied an acceptable substitute.

Present day job work—except in its strictly commercial or ordinary aspect—cannot be identified with that of fifteen or twenty years ago. Enterprise and the reproduction by process of the work of both artist and photographer have greatly altered its style during recent years. Perhaps the tendency of these agencies would be better indicated if we say that the scope of job work has been broadened by the addition of an artistic section. Modern type-founding enterprise has given the job printer of to-day a range in elegant type faces and embellishments that offers him opportunity of making his display tasteful and effective. Process reproduction places at the job printer's disposal the creations of the artist in design, by properly utilising which the printer is still further enabled to meet the requirements of modern artistic taste.

¹ Chapters 33 to 42 are by Mr. G. J. Joyner, author of *Fine Printing*, and holder of prizes for fine work.

There is also a much broader and freer treatment in typographical display generally than existed formerly. Not exactly in fundamental principle, but in manner. Display composition, as always, still has one prime object—the conveying a message; and the reason that display is called into operation is that that message should be given with due regard to the relative importance of the items constituting it. To present this message in the severest possible manner by straight lines of varied types, condensed or sprawling as necessitated by the quantity of words, is no longer held to be the best form of typographical display for every purpose. As we shall show by example, the chief item of a job arranged in two or three short lines—otherwise, “grouped”—will give not only a more forceful expression, but, being less stiff, a more artistic appearance.

Classification of Job Work.—Without laying down any hard and fast lines, we may roughly distinguish between the following varieties :—

- | | |
|--------------------------|----------------------------|
| 1. Posters. | 5. Cards. |
| 2. Show-bills. | 6. Blank forms. |
| 3. Hand-bills. | 7. Labels. |
| 4. Circulars. | 8. Pamphlets and Booklets. |
| 9. Programmes and Menus. | |

Posters are large printed sheets intended to be posted on walls, and to be read by passers-by, sometimes at a considerable distance. They are also called broadsides, placards, and bills. The chief descriptions are : Proclamations, official regulations, auction bills; sermon, bazaar, lecture, theatre, and meeting notices; tradesmen's bills; contents bills, lost and found bills.

Show-bills and *Window-bills* are smaller and neater than posters, and are used for exhibition in shop-windows, inside buildings, and in other places where the reader is comparatively close to them.

Hand-bills are a smaller kind of show-bills, intended to be distributed by hand into the hands of the reader, and therefore not requiring the large type necessary to attract attention in the case of the other two. They may be said to include play-bills, notices of meetings, lectures, entertainments, and so on, and general trade advertisements.

Circulars are a neater kind of hand-bills, intended for distribution through the post or otherwise, and generally under cover of an envelope. There are professional, commercial, and trading circulars, prospectuses of companies, price-lists, notices of removal, and opening of new premises, of partnerships formed and dissolved, and many others.

Cards derive their name from the material they are printed on—that is to say, cardboard or pasteboard, cut up in single cards. Among the descriptions of card printing are visiting and address cards, invitation and at-home cards, ball programmes, tradesmen's cards, admission tickets, direction cards, calendar and time-table cards, menu cards, membership cards, pence and contribution cards, and memorial cards.

Blank Forms include a great variety of printed matter which is intended to be completed in writing, such as cheques, letter and invoice headings, allotment certificates, memorandums, pawntickets—in fact, all kinds of forms which require filling up for special use.

Labels are small forms intended to be affixed to goods; they are either entirely printed, like the labels on pen and match boxes, or are small blank forms in which part of the reading matter has to be supplied by the pen.

Pamphlets and *Booklets* may generally be defined as small books of not more than one sheet, with or without a cover. Pamphlets, however, often run into three or four sheets; and perhaps they are better described as small unbound books, or what in France are known as *brochures*. *Booklets*, in many cases, range to smaller sizes than pamphlets;

upright and oblong 16mo of either royal, demy, or large post being in most common use. For our present purpose we may include among this kind of work catalogues: as commercial, real estate, produce, furniture, booksellers' catalogues, almanacks, etc.

Programmes and *Menus* are printed in various styles, sometimes on paper and sometimes on card.

Sizes of Jobs.—It will be seen that several of the distinctions in the preceding list turn on the *size* of the job; for instance, the difference between a poster and a show-bill. It is highly necessary that the jobbing printer should understand the exact dimensions of all the different kinds of printing and writing paper upon which he may be called on to work; and for two reasons:—

1. If the job is required to be done to the same size as a given specimen or to some size named, the printer must know how that size is to be obtained by cutting up sheets of the regular dimensions.

2. If the size of the job be not specified beforehand, the printer has to determine it, and in determining the size, he has to avoid waste in cutting up the paper.

It has already been stated that whenever possible every job must be done to some regular size. The size may be that of the sheet—that is, broadside; or it may be that of folio, or of some part of the sheet, as a quarter or an eighth; but it should be an equal aliquot part, a portion of which a certain number will make a complete sheet.

There are so many varieties in the dimensions of papers that almost any size may be obtained by sub-division. A list of the regular sizes of papers was given in Chapter III.

Sub-division of Job Work.—It is usual for job work to be subdivided into

- (a) Ordinary or Commercial Work.
- (b) Artistic Work.

What is Ordinary or Commercial Job Work?—It would

GREGOR, SON, NEROVE & CO.

TO
HER
MAJESTY
THE
QUEEN.



Court Dressmakers,
Ladies' Tailors and
Milliners, &c. . . .

Specialists in _____



TAILOR-MADE COATS
AND SKIRTS.
DAY AND EVENING
GOWNS.
DINNER AND TEA
GOWNS.
WEDDING AND RECEPTION
DRESSES.
CARRIAGE AND OPERA
CLOAKS.
WEDDING TROUSSEAUX.
DRIVING HABITS.
DRIVING COATS AND
CAPES.
MILLINERY.

Ladies' and Children's Outfitters,
Silk Mercers and Drapers. . . .

CASTLE STREET, _____

WINDSOR & LONDON,

_____ REGENT STREET.

Example of
Grouping
Display.

ILLUSTRATED CATALOGUES
FOR EVERY TRADE...

WORKS:
GORDON'S BUILDINGS,
GUILDFORD.

JOHN



ORDON & Co.,
LIMITED,

Designers,
Printers, and
Publishers.

CITY OFFICE:
57 Queen Victoria Street,
Two Minutes from
St. Paul's E.C.

CATALOGUES AND
ALBUMS OF VIEWS.

DRAWINGS & DESIGNS
OF ALL CLASSES.

REPRODUCTIONS DIRECT FROM PHOTOGRAPHS OR SKETCHES IN
A NEW AND IMPROVED MANNER 50 PER CENT.

Estimable Price.

...Reduced
Fac-simile of
Rough
Sketch.

1900.

...ILLUSTRATED CATALOGUES
FOR EVERY TRADE...

Works:
GORDON'S BUILDINGS,
GUILDFORD.

JOHN



ORDON & Co.,

LIMITED,

Designers,
Printers and
Publishers.

CITY OFFICE:

57 Queen Victoria Street,

Two Minutes from
St. Paul's, E.C.

CATALOGUES AND
ALBUMS OF VIEWS.

DRAWINGS AND DESIGNS
OF ALL CLASSES.

REPRODUCTIONS DIRECT FROM PHOTOGRAPHS OR SKETCHES BY A NEW
AND IMPROVED METHOD, SAVING 50 PER CENT.

Estimates Free.

...The
Completed
Job.

1900.

The _____ Printers' Register

ESTABLISHED
1863.

GUARANTEED
CIRCULATION,
5000
PER MONTH.

Oldest and Best Trade Journal.
Reliable. Independent.
Best for Advertisements.
Best for Trade News and Articles.

Terms for Advertisements of the
Publishers :

62 . . .
Fleet Street,
London, E.C.

PUBLISHED ON THE
6TH OF THE
MONTH.

Subscription Rates: Fine paper copies,
4s. per annum; Thin paper Copies, 2s. 6d.
per annum. Post Free to Any Part of the
World. Payable in advance.

...Example of
Contrast in
Type Faces.

not be an easy thing to say where commercial work ends and artistic work begins. Commercial work is not comprehended in job composition for commercial subjects. Oftentimes artistic typography enters into the realm of commerce. Artistic work is of value to the man of business. But if the term "Ordinary or Commercial Job Composition" be accepted as applying to all job work of simple, plain type treatment for usual stock sizes of card and paper, an understandable definition is reached. It is work treated in the ordinary conventional way.

What is Artistic Job Composition?—Work not necessarily ornamental, not necessarily plain. The idea, appropriate or original, successfully carried out, is perhaps as good a definition of artistic job work as one needs. The idea may be in the arrangement of the display, or in the tasteful and appropriate application of the types and the work of the artist; in the colouring; or in the size and quality of the material. Any one or a combination of these things may result in artistic typographical effect.

Further, an artistic piece of typography can be achieved without the use of type of ornamental design, or of embellishment of any kind. Mere ornament does not constitute art. Fancy types and ornaments do not constitute artistic typography. But display composition that indicates genius in arrangement, taste in the selection of material—whether it be plain or ornamental—and technical ability in its execution, may safely be designated artistic.

Apart from technical proficiency—which is indispensable to successful achievement in either class—the main difference between artistic job work and ordinary job work, as it affects the compositor, is that the first-named involves a design before being executed. Frequently the preparation of the strictly typographical portion—as distinguished from the selection of size and quality of the material upon which the job is to be printed—of the design devolves upon

the compositor. Hence is open to him a field for the exercise of genius in formulating ideas and embodying the same in designs (rough they may be), and the cultivation of taste in selection from multitudinous type faces, initials, and ornaments.

CHAPTER XXXIX.

JOB WORK COMPOSITION (*continued*).—The Rules of Display—the Selection of Types.

INTELLIGENT display always shows that certain considerations or rules have been observed in its production. Generally, either ordinary or artistic job work involves :—

- (1) Fitness.
- (2) Knowledge of the kind of job required.
- (3) The main idea or message.
- (4) Contrast.
- (5) Legibility.
- (6) Proportion.
- (7) Appropriate type selection.

Fitness.—This is the first consideration and has to be decided before setting a line. All manuscript copy for display should therefore first be read through. The style of job that would be suitable for a Bohemian concert would not be appropriate for an ecclesiastical function, for instance. Again, a card for business purposes would be treated differently from that for a social event, or a scholastic circular from that of a displayed business circular.

The Kind of Job Required.—That is, as to the sort of paper or card to be used, and whether the work will be printed in black, or in one or more colours. These are facts that govern the size, character, and general style of the display. Rough or antique surfaces of paper and card will always bear types

of medium or full strength of face ; while material of smooth finish is in some cases treated with a lighter style of display.

The Main Idea.—In other words, the message that the job is to convey. What is the ruling feature or object of the work? Generally in copy for display there are items of several degrees of importance, such, for instance, as "*What it is about,*" "*Where it is,*" and "*When it is*"; or "*What is offered,*" "*Who offers it,*" and "*The location of the party offering;*" or in the case of well-known firms the *name* may be the most important feature. But the main idea having been duly decided and apportioned, all else should be subordinate, each other line being graded in size or force according to the relation it bears to the chief feature.

Contrast.—The general mode is to follow heavy lines with light ones ; ornamental lines with smaller and plainer ones. Contrast is the key to striking effects in display. Force is perhaps the most noticeable point to be gained by bringing types of heavy and light faces into conjunction ; but elegance and novelty may be obtained by good contrasts, either of quaint type faces with plain, or by judiciously varying the sizes of the lines.

The fourth page of the inset to this section is a practical illustration of contrast. It is an example of "light and shade" in display by a combination of light and heavy faced types.

Contrast also applies to the use of lower case and capitals. Main lines in lower case show to the best advantage if contrasted with small lines in capitals ; and main lines in capitals if contrasted with minor matter in lower case.

Liberal spacing between groups of lines also gives pleasing contrasts.

Legibility.—Mostly this is a vital principle. Occasionally quaintness is a desideratum, and then lines in capitals of quaint founts are permissible. But even in this exception much discretion is involved in obtaining the best results.

Display can be made illegible by too much ornament as well as by the use of too many quaint lines. No desire is left to read a word after the eye has been displeased by an overdose of flourish and filigree, or a conglomeration of ornate type faces. No mere ornament should be allowed to interfere with the clearness, force, and perfect readableness of a job. When the general design admits of free ornamentation the type portions should be not only more boldly treated, so as to catch the eye, but should be in sharp contrast by their compactness and legibility.

As a rule it is safe to repress the tendency to ornament. "Do not put into a job all the ornament it will stand" is a very good working maxim in regard to the point of making display legible.

Proportion of Display means the relative prominence of the different items of an announcement. It can also be defined in this way: Display is called into operation to give emphasis to certain points in the wording. If these points were all of equal importance there would be no need to consider proportion—they would all be treated alike. But in nearly all display there are items of varying importance, and according to the correct proportion of the secondary matter to the first, or that of the third degree to the second, and so on, display is of correct relative value.

In nearly every good piece of display you will find one controlling idea that forces itself to the front, behind which all the other items are ranged according to their importance. In practice, failure to observe this fact will defeat the purpose of display. The proper treatment for relative value—the "bringing out" of main lines and the setting back of others subordinate to them—shows the compositor to be possessed of a true sense of proportion.

Display lines too near of a size produce sameness, and thus proper effect is nullified.

In subjecting the less important matter, it is necessary to

avoid such minuteness as would render the wording difficult to read. By simply using small, yet clear-faced types, in preference to types so large that they clash with the main lines, both readability and proportion are ensured.

Type Selection.—Appropriate type selection in display work is neither a simple nor an insignificant matter. Having formed a correct idea of the relative value of the items for display, then follows the question of type selection to give them good typographical expression. Type selection is so largely a matter of taste and circumstance that it could not well be confined to "hard and fast" rules; but a few considerations that obtain in efficient type selection may help the compositor in forming correct ideas in this connection.

The young compositor's greatest weakness is too much affection for quaint and fancy founts. Next to this is the fascination in new type, most unsuitable material often being selected for no other reason than that it is new. The fancy faces and new type craze must be put entirely on one side, and an unbiassed judgment brought to bear on the matter of selecting faces suitable—or, at least, not inappropriate—to the subject of the work.

The proximity of different types that possess a degree of quaintness is very seldom successful. It may be taken as a safe rule never to associate any two or more founts of either fantastic or fanciful design. Two or three sizes of one of these styles is always sufficient for one job, and if these can be intervened with lines in plain type so much the better.

Lines in quaint caps. seldom pass muster. Sometimes a pleasing effect is obtained by selecting caps. of quaint character for such words as "Programme," or "Part I.," or "London;" but it should only be done in cases where one can tell by the merest glance what the word or words should be. It is mistaking the province of typography to cause one to spell words in order to divine their meaning. If neat and severely plain lines of type—like lining sanserif for example—

are introduced between lines brought out in type of artistic and ornamental character, a very good effect results. The association is advantageous to both. The plain lines gain in importance by affording contrast and preventing a too ornate effect, while the design of the faces mentioned is more clearly defined.

Another notable feature in type selection is the effect to be obtained by associating light and heavy faces. In some instances work may be best served by selecting faces of light calibre; and again some work demands heavy faces. But instructions are usually forthcoming when display has to be treated in the "all light" or "all heavy" style. A too liberal use of light faces will oftentimes render display tame and ineffective, just as too many heavy faces will make it sombre and gross. In each case contrast is needed. To obtain pleasing effect the type selection should give light and shade in proportion to the value of the words or sentences.

Excellent examples of light and shade may be obtained by associating ordinary body founts with heavy display lines. This is pre-eminently a modern style of selection, and one of the most successful combinations ever evolved. There is scarcely a display face—speaking of the strong ones—that the style does not admit. Of the whole range of bold, artistic faces, down to homely antiques and sanserifs, none looks out of place with either modern or old style body founts, or French old style.

Jenson old style—otherwise Venetian old style—used in place of body founts, with bold display lines, is perhaps the most perfect combination for readability. The contrast is not so marked, as the Jenson face is of medium strength; but the effect is telling.

Although the variety of founts is ever increasing, selection cannot be said to be consequently more difficult. Nearly all display faces—certainly the best faces—are cast in series,

some of which are well graded in size ; and displaying jobs in series is now a firmly-established mode.

We have already said that before composition one requires to know whether a job is to be worked in black or colour. If for colour, a reason is furnished for selecting founts of full and medium strength of face respectively. Generally, for work in gold and colour, faces of good strength are desirable.

All kinds of blacks—or old English—are types of distinctive character. Their special province is in work of an ecclesiastical nature. They can of course be used to advantage in other classes of display ; but discretion should be exercised so that they are not introduced inappropriately. Scripts also have a special province in noteheads, billheads, and statements.

Names, dates, and addresses with numbers should not be set in founts having letters or figures that might be misconstrued. It is in such cases as these that no doubtful letter or indistinct figure should be allowed a place.

If an ornamental design or illustration is to be used, its character influences the type selection. Ornamental and straggling type faces mar the effect of the graceful and flowing productions of the artist in design. The more free the design, the more compact should be the type faces.

CHAPTER XL.

JOB WORK COMPOSITION.—Ordinary or Commercial Display—Memorandum Heads—Billheads or Invoices—Business Cards.

Ordinary or Commercial Display.—We have defined this class of display as work done in the ordinary conventional way. The chief characteristic in the arrangement of lines in ordinary display is that they take a central position; that is, all lines not full to measure are centred. Until recent years that was practically the only arrangement followed in display lines. It was usual to first set the item or items of chief importance in full lines of expanded or condensed types as necessitated by the number or length of words. Then followed the items of less importance in lines of varying length, so selected that no two or more should clash in length, or be alike in style of face. What may be termed “connecting words” (such as “of,” “and,” “the,” and so on) were made catch-lines in small capitals. Lower case for the principal lines was not deemed good taste.

Although in display of central position the old arrangement holds good—in that it consists of full, three-quarter, and shorter lines, relieved by catch-lines—some of the restrictions that formerly hampered the display hand have fortunately been cast aside. It is not, for instance, considered absolutely necessary to use capitals for the main item; or that the same should be a full line; or, again, that it should be contained in one line. And, further, display of central position is at present much less varied in style in regard to the number of faces used. It is no longer necessary to show as many

different faces as possible in one job. The best style of commercial display results from using a few sizes of one series for the leading items, and the small sizes of another series for the minor wording.

The multitudinous kinds of productions that are known as jobs render it impracticable to specify them all, or to treat them all in detail. Practical analysis of certain of the most familiar classes of job work will best serve as a key to an understanding of the principles observed generally.

Prior to proceeding to analyse some of the jobs that the display compositor is most frequently engaged upon, it will be well to revert to the matters of setting the composing-stick and spacing.

Setting the Composing-stick.—We have already advised the use of either pica quads or pica lower-case m's, placed sideways, for setting the composing-stick to the required width. It is very essential that the learner should follow this instruction in commencing job work. Oftentimes an experienced job compositor will set his stick to leads; but he knows where to discriminate both in the amount of "play" the leads require to prevent "binding" and in the nature of the job. The beginner, if left to follow his own way, invariably sets his stick hard to the leads. This, of course, is a mistake, and the leads getting the side grip of the lock-up instead of the lines of type, results in the lines working off their feet when the job is being printed.

Ascertain first of all that the stick is true to gauge by running the slide up to the head; if they fit closely together, the lower-case pica m's or pica quads of the required number can be put in place, and the slide fixed so that they can be lifted out easily. If the stick is not true to gauge it should be made so by inserting a piece of paper or card either above or below the screw as the discrepancy necessitates.

Spacing in Display Work.—We may supplement our instructions on spacing by saying that the correct principle

for spacing display lines is the space or spaces amounting to the thickness of the average letter of the fount used. This term is not always easily comprehended by the young compositor. The following further explanation is therefore offered. The cap. W and the cap. M of most founts are broader, and the cap. I and cap. J are narrower, than the other letters. The former are too broad and the latter too narrow to govern the spacing. So that any of the other letters—between the width of which there is not much difference—will stand as the average thickness of caps. The lower-case letters that would be too wide to be accepted as the average thickness are m and w, and those too narrow are f, i, j, l, and t.

Practically in every instance the letter "E" may be taken as the average letter of the fount, whether it be condensed, square, or expanded. Thus you should put in the space or spaces about equal to the lower-case "e" if a lower-case line, or equal to the cap. "E" if a cap. line.

Lower-case antique or clarendon lines and paragraphs always need at least en quad spacing.

In display lines always put a little less space after commas and full points than in those places where there are no points. This applies to all cases where the full point denotes a contraction. To give display lines that evenness of appearance that is pleasing to the eye involves careful spacing. But good spacing is not a time-consuming operation. It is only a matter of applied technical knowledge.

As regards spacing between the lines, or "whiting out," as it is called, little can be said save that plenty of white judiciously distributed throughout is essential to effective display. As was stated in the writer's *Fine Printing*: "No standard can be set up to govern the leading or whiting out of job work owing to its diverse nature To regulate the position of the different lines so that they

appear well balanced and distinct is an art which can only be gained by practice and careful observation."

What Reprints should Teach.—To the beginner in display generally falls a very liberal quantity of reprint jobs. In a well-governed office these would offer very valuable object lessons to the young compositor. If he notes well the items that stand most prominent, and the sizes and styles of the types used for those items, he will not get very wide of the correct interpretation when left to display similar jobs from manuscript.

There are, unfortunately, two reasons that militate against the elementary technical utility of reprint jobs. One is that in some offices there are no recognised models as to style for certain jobs of the commercial class. Memorandums, bill-heads, business cards, or noteheads are treated in such a variable manner as to the sizes and styles of types that the definite fundamental idea or object of such work is never conveyed to the mind of the tyro; neither do they indicate to him any limit as to the sizes and styles of types that may properly be used in the display of these and similar jobs. The other reason is that the learner is apt to regard reprint work as exceedingly monotonous and uninteresting. The opportunity to distinguish himself in display seems a very long time in coming—when it comes, he oftentimes fails completely because he has not sufficiently noted the principles contained in the reprint jobs he has had to do to enable him to put those principles into practice.

As will be seen, there may be some variations in style without affecting the fundamental idea of work of the class under consideration.

Memorandum Heads.—We will take a memorandum of the ordinary kind—wide way of a large post octavo. It may be set in a series of sanserif, or it may be in scripts, or there may be several faces used; but if it be a correct model, the first point to be noted is that the name of the firm is the

most important item. That is the fundamental idea of a memorandum form—the name is always the first point that concerns the recipient. The calling and place of business are secondary considerations. Yet, it is not an uncommon experience to find the calling, or the word “Memorandum,” or even the address the overpowering item.

As to the limit in size of type for an octavo memo, it would be safe to place it at great primer and eighteen point (3-line nonpareil). This is sometimes exceeded in body if scripts or types of very light calibre are used; but these do not give a larger average of printed face. Some of the best commercial Memorandum headings do not exceed pica for the name; this, in sanserif, with address, calling, and the word “Memorandum” in smaller sizes of the same series—unless a condensed sanserif had to be used on account of the length of the firm’s designation—with dotted blanks, and script or italic for the year, figures, and the word “To,” makes one of the most acceptable headings for commercial purposes. The dotted rules should be in exact alignment with the type, and the two parts, or sides, accurately made up to ensure the usual double thin rules being perfectly straight. These are the points that indicate the quality of the workmanship. The reason why script or italic is best for the year, figures, and “To” is because these types are more in harmony with handwriting than types of upright design.

A good commercial effect for a memorandum heading is also obtained by using two or three sizes of script with lining sanserif for telegraph or telephone items and minor particulars. But whether the foregoing or more varied styles are adopted, all else should be subservient to the name.

Sometimes memorandums are set the narrow way of the octavo. In this case the name, calling, and address of the firm generally follow in the same order and arrangement as a displayed business card. The heading is then followed by

the date and name blanks. This style, however, does not affect the rule we have laid down as to the name being the most important feature of the job.

For a quarto memorandum heading the type limits given for an octavo may be slightly exceeded; but it is not essential or necessary to take advantage of the larger paper.

Billheads and Invoices.—The leading idea of a billhead or invoice is also the name of the firm. In receiving goods or looking through a file of invoices it is all that one needs for identification. We also find here the same reason for using script and italic for the figures after the date blank, and for the "M" which usually precedes the name blank. For the words "Dr. to" or "Bought of" script was at one time very frequently used, perhaps on account of the words being supplied in electros by the typefounders. Blacks and in some cases a smaller size of the same style as the name are now as much in vogue for these items as script.

The size of the leading line for a billhead is to some extent governed by the depth of the heading and the number of lines; but if the name is in capitals 2-line pica is a very fair average. Scripts, blacks, Latins, sanserifs, and old styles (Roman and italic) will, as a rule, furnish all the variety that is necessary for a commercial billhead or invoice.

A *Statement* is usually either large post 8vo or 6to in size. So far as composition is concerned it has the same fundamental idea as a billhead. A slight modification in size of type is needed. With this exception the foregoing remarks on billheads will hold good.

Business Cards.—In a business card we find the chief object in the calling. The point of first concern to the recipient is the nature of the business of the party presenting it. This is sometimes conveyed by the style under which the firm trades; in this case and in those cases

where firms are pre-eminent in name, the chief object is in the designation of the firm, and the calling is secondary. Generally, though, the following is the order of importance: (1) the calling, (2) the name, (3) the place of business.

Business cards displayed in the central position style are mostly treated in two ways. One is to set the matter so that about two ems pica margin is left all round; and the other is to allow nearly six ems margin at the top. The latter generally results in a superior appearance to that of setting full to the card.

Cards in the ordinary style of display for social and other functions can be gauged as to the degree of importance of the items by the method of deduction we have laid down in No. 3 of the "Rules of Display," page 427.

Type faces for cards up to double-small often range to as large as 3-line pica for the principal item; but if type of the size mentioned is used, it should be a lower-case line and not heavy in character. For example, we will suppose a large card, containing an average amount of matter, is to be set; the leading line—or "what it is about"—would not be too large in lower case of 3-line Gallic old style—to mention a widely-known face. "Where it is" and "when it is" could go in lower case of the 2-line and 3-line nonpareil respectively of the same series. If any of a fourth degree, we should use pica Gallic old style, and for the minor wording, two or three sizes of lining sanserif. These two faces give very good contrast, the Gallic being light of face, and the sanserif fairly strong; and there would be also that combination of lower case and capitals which is found in all good display.

The result would be a comparatively plain card; but if a more ornate appearance was desired you will readily perceive that it could be gained by substituting for the Gallic a more fanciful series—say, karnac, renaissance, or artist's grotesque.

If a heavier-faced type than the Gallic were used, say, of

the Childs or the De Vinne class, 2-line pica would be large enough for the chief item, and the second and third items would be graded proportionately. With heavy-faced main lines lining Athenian, or other light-faced type, for the minor matter would afford the necessary relief.

Noteheads and Letterheads.—Between a notehead and a letterhead there is no material difference in style of treatment, only in size. The former is invariably the term applied to octavo, and the latter to quarto. As a rule, both have two measures. The first, or side, measure of a notehead contains the name, calling, or other particulars of a firm; this is generally set to eight ems. The second measure contains the address and date line, set to eighteen ems, a piece of 2-em furniture between the two measures makes up the total width to twenty-eight ems, which is an average width for a notehead.

The measures for a letterhead are 10 and 24 ems respectively, with 4 or 6 ems between to total 38 or 40 ems, as best suits the margin to the quantity of wording: a small amount of matter needs a little more margin than a medium quantity.

Whether the side matter is to be centred exactly opposite the matter in the wider measure, or ranged above or below it, is a point for individual decision. To centre the address lines opposite the side lines is the arrangement chiefly adopted, leaving the date line to fall as it may.

A few sizes of nonpareil lining sanserif for the side matter and script for the address is the most approved type selection for noteheads and letterheads of the ordinary class. Probably this is owing to its being the nearest resemblance of letterpress to lithographic and copperplate for similar purposes.

For noteheads 2-line script is large enough for the address lines; but in letterheads a 3-line or 4-line script is often advantageous.

Several successful variations in type selection for note-heads and letterheads are available to most jobbing compositors; but the selection we have indicated is a safe one for the beginner until a more cultivated taste ensures him against transgressing the bounds of common-sense by using type that is unsuitable in style and size.

Circulars.—Of all display work probably the circular requires most discrimination. No other class of job work embraces a larger variety of subject, and none is more variable in quantity. Circulars of the ordinary class run mostly on two sizes: large post octavo and quarto. Large post folio and demy octavo and quarto are more rare than the sizes first named.

Circulars can be broadly classified under three heads: (1) Displayed head-line or heading and "run-on" body; (2) semi-displayed—that is, an item brought out here and there; and (3) fully displayed.

(1) *Run on with Head-line.*—An octavo or quarto circular with displayed head-line or heading does not present much difficulty even to the young compositor. The average octavo circular is set to 22 ems, and is spaced to a depth of from 36 to 38 ems. The measure for an average quarto is 38 ems, with a depth of from 48 to 50 ems. In both cases a "heavy" circular (that is, one with more than the average amount of matter) would exceed these measurements somewhat; while its opposite, a "light" circular, would be less both in width and depth—the larger amount of matter requiring less and the smaller amount more margin than the average to give them a suitable appearance.

In the absence of instructions as to the size of type to be used for the body of a circular of this class, having set your stick to the given measure, you would compose a line of the first paragraph of the copy in the type that you deemed most likely to suit the quantity of matter, and then counting the number of lines in the copy, calculate how many lines it

would make in the type selected. Having ascertained the number of lines, put the corresponding number of ems in quads down the galley, and you will have the depth that the body lines will make. This will enable you to decide as to the leading between lines, or whether a larger or smaller size of type than the one tried will be best for the quantity of matter.

The size for the display of the heading is governed by the size of the body matter. The display for a circular the body of which is set in brevier would not, of course, be so large as that for one in long primer; or one in long primer so large as that for one in pica.

(2) *Semi-Display*.—A semi-displayed circular, as we have already pointed out, is one in which items or points of importance are displayed between paragraphs generally of an ordinary body fount. It is an effective style, and yet one that is easily understood. It only fails in effect when type of too weak a face is selected for the displayed items. Light and shade give the best effects in display; and in this class of work body founts give what may be called the "light," so that type having good strength of face is essential for the displayed lines.

The method of procedure may be similar to that set forth in the preceding case. That is, cast up the copy to decide the size most suitable for the run-on portions, and then set the display so as to utilise the space to advantage. It may, however, be desirable to obtain special emphasis in the display or to use a certain size and style of type, and in this event the run-on matter can be made conformable by being set according to the space remaining after the display has been arranged.

Many semi-displayed circulars, both octavo and quarto, commence with a noteheading arrangement; that is, a small side column on the left and a wider measure containing the address on the right. For these the heading

should be 4 or 6 ems wider than the body of the circular to get a good effect.

Take, for example, the measures for a large post octavo. We have given the total width of a noteheading of this size as 28 ems, and for the body of an octavo circular 22 ems, and these hold good for the average semi-displayed octavo circular. The side column referred to would be 8 ems and the address measure 18 ems; 2 ems between the two measures gives a width of 28 ems. The body being set to 22 ems would require 3-em furniture down each side.

Following the notehead style of putting the address larger than the name and calling, an opportunity is afforded in most semi-displayed circulars of judiciously reversing this at the foot by bringing out the name larger than the address.

In the class of circular under consideration, the intervening display lines are not usually set full to measure. If an item is too long to look well in one line, it should take up two lines. It is better to turn a word or words over and make a second line than to have the line the same width as the body matter. If the display lines are spaced more to the right, in preference to being centred, say to the extent of 4 to 6 ems, the appearance is very good.

(3) *Full Display*.—With a circular of the fully displayed variety the principal item is set first, and the other items follow according to their respective importance. Having set the principal line, the items of the second and third degrees must not be allowed to clash in size and length with that line. Unless relieved by two or three intervening lines of minor importance, lines of the second and third degrees should not be full to the measure, or they would clash in length. They must also be in due proportion to the main line so that they in no way detract from it. Sameness in size is fatal to good effect in diversified ordinary display.

There is oftentimes matter of a fourth or even fifth degree of importance in circular display, and these follow in respective order, the minor matter, such as catch-lines, coming last.

When the whole of the copy has been set, the dividing rules and dashes are added where needed for separating self-contained items. The length of the rules is determined by the length of the line or parts they have to divide. Generally they are better if shorter rather than longer than the type lines. Unless the circular is very "open" in style, plain rules are better than elaborate ornamental arrangements, as the latter are liable to render the type portions less readable and effective.

Display matter should not be set solid. It is a very good plan to drop in a couple of leads after each display line, and then, when the whole of the matter is set, finally regulate the whiting out.

Journal, Magazine, and General Advertisement Display.—Much of this class of display is planned as to arrangement before it reaches the compositor. He is also invariably confined to a given area. Telling advertisement, however, depends very largely on the compositor's knowledge of the force of type and the technical skill with which he carries out the idea supplied. It is advisable therefore to note the points in well-displayed advertisements whenever opportunity offers.

Proportion is always the most important thing in advertisement display. To attempt to emphasise every display line is generally to court disaster in the matter of effect. Some one feature—it may be a catch-word or phrase, or the actual subject of the advertisement—should stand out strikingly above everything else to obtain distinction for each advertisement. Sameness of size is not good in any class of display, and especially is it to be avoided in advertisement display. If nothing appeals spontaneously to the

eye in an advertisement it lacks the primary object of advertising. We have already explained proportion in display in our rules, and its tendency is practically illustrated in the display supplement.

Journal and magazine advertisements are frequently limited to the use of a comparatively small range of display faces. These rarely include anything of a "fancy" character. Quite plain—or at all events easily readable—bold faces used in conjunction with ordinary body founts give the best results for this class of advertisement.

Ornament should only be used in an advertisement if indicated, and then not in too assertive a way for the wording. It is a mistake to think that an advertisement in order to be attractive must have a lot of twisted rule, and that every available space must be supplied with an ornament.

In cases of more than one advertisement on a page it is more satisfactory to use a different series of display faces for each different advertisement in order to obtain distinction for each.

Before commencing the composition, study the subject-matter thoroughly and acquaint yourself with the important features.

Labels form a very wide field in display, and they are diverse in character. The two extremes of the severely plain and bold and the neatly ornamental are comprehended in this class of work. In the purpose of the label will be found the key to its typographical dress.

A *Luggage* or *Box Label* should be both bold and plain. Antiques and sanserifs find pre-eminently their right sphere here. The figures and characters of these founts leave no room for doubt as to what is intended, and perfect readability is essential.

Address Labels, either for paper or manilla, generally have at the head or foot the word "From" preceding the

name. "From" should not be set as large as the name. We have seen cases where both have been in the same type, as "From John Jones" (in lower case), or "FROM JOHN JONES" (in capitals), with the result that at first sight "From" looks like part of the name. The recipient knows it is from some one; the word is therefore implied and of little importance. A very good rule is to put the word about half the size of the name, and distinctness is obtained for both.

In cases of blanks leave ample room for the writing.

Chemists' Labels, Bottle Labels, and Packet Labels, or Wrappers, admit of a lighter, more elegant, and more ornamental style. Some of these are printed in one, two, and more colours or tints. Most labels of this class have rule and other borders. In old-established offices it is not unusual to find sets of thick and thin and treble rules, cut to various sizes and mitred, exclusively for label work. With more modern plant, rule borders are made up from the various labour-saving sets. Not that a quicker or better result is gained, for labour-saving sets require skilful handling to get perfect joins; but, having en and em quad pieces, they probably offer an advantage in making up borders that vary so much in size as those experienced in the general run of label work.

Labels can be made tasteful and attractive in appearance with ornament and border, especially in the way of horizontal and vertical bands. These, however, should not be introduced at the expense of the wording. Mere embellishment to the detriment of distinctness and readability is here, as in all display composition, a mistake.

For justifying type in *shapes* and *circles* thin, medium, or thick cardboard (according to the space available) is best and quickest if carefully manipulated. Perhaps the one drawback to cardboard is its liability to shrinkage when it becomes dry after being damped in the washing of the

forme; but if the justification is firmly done there is little danger of the shrinkage being sufficient to allow the contents of the shape or circle to drop out.

To set an ordinary circle containing an average amount of matter, say, a line of type running round the inside and straight lines in the centre, you would take a piece of waste commercial card and cut a strip about the depth of a lead and long enough to go round the inside of the circle. Cut the ends diagonally, as shown in Fig. 1. The object of this is seen in Fig. 2, which indicates the ends



FIG. 1.



FIG. 2.

of the card in the circle. This method gives you greater freedom in determining the length of the card. Whether the opening is a little more or less does not matter; provided it is not too great, it is impossible for the type to slip through.

The card in place, the line to go round the circle can be set, dropped in—if working on a level surface, like the stone—and loosely spaced. This line often consists of two parts, such as a name and address, the first part going head of type to circle and the second part foot of type to circle. If you were working on the frame you would drop in the top half of the line only, and then proceed to cut another piece of card, in the same way as the first, to go round inside the line, dropping in the remainder of the circular line—still leaving it incompletely justified—after the inner ring of card is in place.

Set the matter for the centre next, in such lines as a rough cast-off of the matter will permit ; but neither finally justify nor white out until you are sure the lines are in right position. The completing spaces in the final justification should be between words, and not at the ends of the lines next to the card.

Cheques.—One of the chief points in the composition of cheques is the alignment of the rules to type. For example, if you have a rule to justify to a word in pica italic of ordinary face, the following would generally result in correct alignment : a line of nonpareil quads, a thin lead, the rule, and a thick lead. Pica types of bolder face would require the thick lead before the rule and the thin lead after it. Brevier quads, the rule, and a thick lead are sometimes correct for alignment ; but it depends on the type-founder's standard. Where accurate alignment is not easy of attainment it is always best to have the rule rather below than above line.

Before composing a cheque, it is well to know whether the book will be stabbed or stitched. Cheque books for stabbing require more margin at the back than books of stitched sections, so that the measures for the forme would total about 3 ems less—say, 1 em on the counterfoil and 2 ems on the tear-off—than the former.

As a rule, cheques are set rather “full,” the object being to give as much space as possible for writing purposes. $2\frac{1}{2}$ ems margin top and bottom and 3 ems margin back and front is a fair average for an untrimmed large post long octavo, to be worked first and third for stitching. Larger sizes more and smaller sizes less respectively. The allowance for trimming at front is a matter of position in working.

The counterfoil is set about half the width of the tear-off in the case of cheques for a single perforation. In some few instances the two measures are equal ; but this is usually

indicated. With two perforations the tear-offs are in most cases set to the same width.

Cheques for working two or more at once may be set a little deeper than the dimensions we have given. As it is only necessary to allow for trimming at top and bottom, the make-up is regulated accordingly.

For the division of counterfoil and tear-off the cheque designs of the type-founder look better for ordinary commercial cheques and receipts than made-up combinations of border. The width of the design used should be governed by the exigencies of size of book and quantity of matter.

Italic and script being inclined in the direction of handwriting look well for the words preceding blanks.

Auctioneers' Particulars and Conditions are regarded from different standpoints by London and provincial printers. By the former, in too many cases, this is considered a very ordinary class of work, and it is set with little or no taste; by the latter, it is regarded as an opportunity for display of the highest merit in the way of well-chosen lines and good spacing and whiting-out. A sense of proportion and the other points mentioned chiefly mark the difference between the two productions; so it does not necessarily follow that the composition of the one is done quicker than the other.

Particulars and Conditions of Sale are mainly of large post folio or foolscap folio size, and consist of three pages, with endorse and agreement on the fourth page; the measures for the two sizes being 46 ems and 38 ems respectively.

In the front page, or title, the points of chief importance are the prime object of the sale, the name of the district or town in which it is located, the name of the auctioneer, and the rental value. The name of the property, or road or street in which it is situate, and place and date of sale are

about of equal import. Having first made—or obtained if available—a reglet gauge of the depth of the page, you would set the lines in the order given, with a due sense of the relation of one to the other, taking care that nothing clashes in size with the main items, and drop them on the galley in about the position they will occupy in the page. Then add the customary rules each side of the auctioneer's name, and you have at once a fair outline of the style of the page. Put the reglet gauge down the galley at the end of the lines and set the minor matter.

The compositor almost always has it in his power to qualify the principal display by judicious arrangement of minor matter. For example, a sentence or paragraph may be in one long line or in two or three short lines.

The main item in the title of well-displayed particulars is often set as large as 5-line or 6-line pica. Types of the Latin and Old English faces are mostly favoured for the principal line.

In page 2, which consists of the particulars proper, the display is not difficult. It may consist of one or more lots. In either case there would be the chief item of the lot, its name, location, rental value, or quantity. These should be subservient in size to the types used in the title. Other items are brought out in accordance to their value and indication.

"Conditions of Sale" should match the word "Particulars" on the opposite page. Whether the body of the conditions is set in brevier, bourgeois, long primer, small pica, or other type is decided by the quantity of matter, and whether it is preferred that the same should be thin or thick leaded. It is generally necessary to cast-off the copy. For method of casting-off manuscript, see page 316.

The "Endorse" falls on the second quarter of the fourth page, and is generally a repetition of the principal wording of the title. The style of the title in miniature is a very good guide to its display.

The "Agreement" or "Memorandum" takes the lower half of the fourth page. Usually it is set in pica italic of modern or old style face, as accords with the face of the other body founts used in the job. If the head-line is set in a size smaller of the same kind of type as used for the headlines of the second and third pages it is a point in the direction of a harmonious whole.

Where Particulars and Conditions are a frequent output of the office, it is usual to keep a set in chase. In this event, the mode of procedure is to lay up the forme on the stone, and, having loosened the quoins, lift out the lines that cannot be made use of. The new lines are set and dropped in place, and the lines that will "work in" by altering are duly utilised, as well as the general make-up.

Window Bills.—It is a comparatively easy stage from the foregoing to the composition of a window-bill of crown, demy, or royal folio size. These are the sizes mostly in request; but for fêtes, flower shows, and some other purposes, the long folio of double crown and double demy are not uncommon; the widths of the latter are the same as crown folio and demy folio respectively. Window-bills are sometimes called show-bills. Reglets for these standard sizes are part of the resources of every well-appointed office.

It is usual to set window-bills on the stone. The chase, head and side furniture, and side and foot sticks should be first arranged in order.

Proceed with the composition by setting the main item of the bill in one or two lines as will best serve. It is necessary to set this first as it governs the size of the remainder—it is the "What" of the bill. "Where" and "When," or their equivalents, are the matters of the second and third degrees of importance, and follow next. Then add the other items in full, three-quarter, or half

lines in such manner as not to interfere with the perfect legibility and prominence of the main lines. If any doubt is felt as to the suitability of size of the principal lines, they can be put in place and justified after the other matter has been set. The beginner frequently avails himself of this plan, until practice and experience render him adept in selecting lines.

Other than the chief points for which arrestive effect is desired can be treated in various ways. The following are merely suggestive :—

(1) By arrangement :—

THIS WAY is an indication of an effective arrangement for bringing out a word or words to catch the eye, and then following with the other wording in smaller type.

(2) By underscoring a word or words with single, double, or treble rules. (3) By a contrast of type face, such as bold sanserif italic against ordinary antique or Roman. (4) By the introduction of a “black” (that is, bold) index or “fist.”

Posters are variously known as “placards,” “broad-sides,” and “bills.” The mode of procedure in the composition of posters has been anticipated in the preceding remarks on window-bills. In both classes the only exception is in the case of a heavy quantity of run-on matter. This might mean that a certain fount of type only would carry the job through. In this case you would set the body matter first, with a nonpareil or lead between the lines, or solid, according to circumstances, and then set the display portion to fit the space available.

For poster and window-bill work the compositor will find a knowledge of the dimensions of the various sheets—say, from crown folio to quad demy—very useful. These will

be found on page 29 and should be committed to memory. As an illustration of their utility: A double crown is 30 inches deep; say the three principal lines are 30, 20, and 16 line respectively, there are 6 ems to the inch, so that 11 inches of the space are taken up. Allow 2 inches for the top and bottom margins, and it shows that 17 inches are available for the remainder of the copy and the whiting-out. Mentally calculate the space taken up as you proceed with the other lines, until only the catch lines and other minor portions remain to be set; whether these shall be in great primer, or double pica, or 2-line English, is usually a matter of no concern except to the compositor and the space he has available. Knowing the area one has to take up, and mentally casting it off as the composition is proceeded with, is without doubt the best means of attaining accuracy in this class of display.

A few minutes to read and consider the copy before commencing the composition of a poster is generally warranted by the greater accuracy of the result. In the end it will often prove a saving of time.

To obtain a well-balanced poster the largest line should not fall at the top, nor below the centre, but about the position called the "shoulder"—say one-fourth or one-third down. If the copy has not been constructed to allow of this, permission should, if possible, be obtained to transpose some of the wording to get a good balance of prominent lines.

Types of bold, easily readable design are, as a rule, best for posters, the guiding idea being that the gist of the message should be conveyed to the mind at a glance. Types of fanciful design, and scripts, and blacks of various degrees, require handling with considerable discretion to obtain striking effects in poster work. They are out of place in bills containing a large number of display lines, especially if the latter are of a widely different

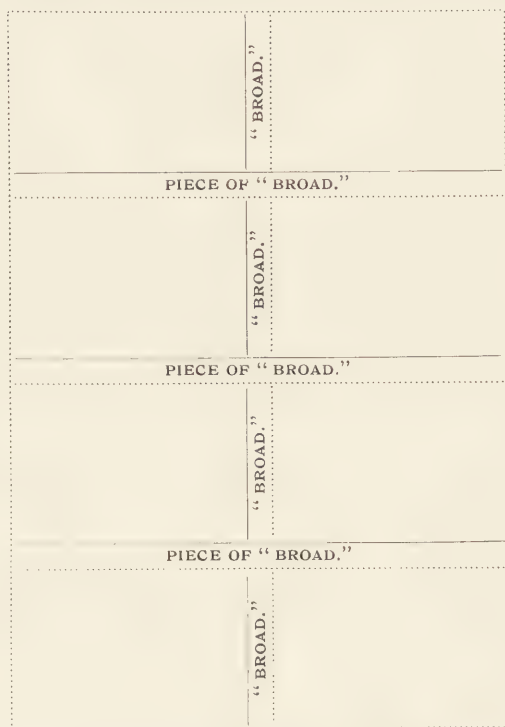
character. Lines of the types named are invariably lower-case lines and show a considerable amount of white above and below, and unless the remainder of the bill is set so as to ensure a neat and open effect, the result is an ugly, irregular appearance. Good effects are obtainable from scripts, blacks, and fancy poster founts, if used in series, and an openness corresponding to their style maintained throughout.

When a poster is made up of several sheets it can be planned by laying the sheets on the floor and laying out the lines unspaced on the same ; or the sheets can be pasted together ; or chalk marks the size of each sheet, including overlapping, are drawn on the floor, when the whole bill may be set and approximately whited out so that a very good idea may be formed as to effect, the type afterwards being pulled piecemeal at press and pasted on the full-sized bill made up of the various sheets. Of course, where floor space is limited, as is often the case, the whole thing has to be done by calculation and measurement. In the latter case, the principal lines would be selected and the depth marked off on the sheet, and also the depth of the minor lines and the whiting-out accurately calculated before commencing the composition proper.

Probably the more satisfactory method is that of laying the sheets on the floor. Lay the number of sheets constituting the poster flush as shown in the plan on the following page.

The dotted lines represent the edges of the sheets. The pieces of "broad" furniture reserve the space required for pasting over, 4 ems being a very good average for the purpose. Thus, the four left-hand sheets have 4 ems less width in type area than the four right-hand sheets ; and the first, second, and third pairs have 4 ems less depth in type area than the fourth pair. Top and bottom margins have to be allowed for in the first and fourth pairs respectively.

After the lines have been put down, the spacing between word and line is roughly approximated by reglet, furniture, and quotations up to the pieces of "broad," which denote the dividing marks of each sheet. At this stage the whole should be read by copy, and then the lines of the first sheet



PLAN OF AN EIGHT-SHEET POSTER.

may be justified in the stick and put in chase on the stone in the ordinary way.

The left-hand sheets do not, of course, require narrower reglets than the right-hand sheets. The lines of the former are merely "kept in" 4 ems at the ends.

It frequently happens, however, that in the use of very deep letters, say 12, 18, or 30 inches in depth, for the main line, one of these letters would fall exactly in the middle of the two halves. The line is spaced out accurately to the full width, and the central letter is then sawn down the dividing line, half being placed in one forme and half in the other—the half for the left hand sheet being placed so as to work 4 ems from the edge, while the half in the right hand sheet is imposed so as to work *flush* with the edge, thus allowing the two parts to touch perfectly when pasted up on the hoarding.

With posters of several sheets, it is not usual to lock up the whole of the sheets in immediate succession. For example, with an eight-sheet poster, in most cases the first and second left-hand sheets would be sufficient. As each came from the machine after being worked it would be utilised for the first and second right-hand sheets, which contain the corresponding parts of the lines. The third and fourth left-hand sheets would then follow, to be utilised, in like manner, for the third and fourth right-hand sheets. This is called having "one forme ready over another." Its application in the case of posters of smaller or larger number of sheets is apparent.

As has been said in one of the trade papers, much may be learned by the young compositor himself in studying the posters on the hoardings. "There will be no lack of material here. Let him note the effect each individual one has on his own mind—whether pleasing or otherwise—and the reason why; and in a very short time he will be able to criticise correctly and without hesitation. Knowing the means by which others obtain their effective bits, or the pitfalls into which they may have stumbled, when his own time comes he will find that the lessons thus learned in theory will be valuable in practice."

In justifying poster lines, wood type should be spaced

rather tighter to the measure than metal type. Or, if spaced equally, an extra thick lead may be put in lines of condensed wood letter, and a thin lead in wood lines of wider face, before locking up. All wood lines give more or less in width in lock-up, according as they contain many or few letters.

After fitting the bottom quoins with the fingers, remove the sidestick and push each line well over to the side furniture. This can be most effectually done with the shooting-stick and a wooden quoin. The quoin should be wide enough to reach from the lines to within two or three ems of the chase; then insert the end of the shooting-stick and use as a lever. This will greatly assist in getting the poster to lift, and will make the spaces between words quite secure. The process also renders the form less liable to spring, and the pressman is not so likely to be troubled with rising spaces in working.

CHAPTER XLI.

JOB WORK COMPOSITION (*continued*).—Artistic Display—the Need for Taste—Grouping—Designing—Display in Series—the Use of Process Blocks in Display Work.

ORDINARY display, as we have demonstrated by analysis, is display treated in the ordinary conventional manner. No design is required to guide the compositor in ordinary display. It is comparatively easy of achievement under the principles and rules we have laid down in the foregoing section. From year end to year end its characteristics may be repeated without deviation of style. But with artistic display a plan, or an idea, or some individuality of style is involved. In ordinary work, too, the usual stock sizes of paper and card are, in the main, adhered to. Frequently the plan or idea of an artistic job begins with the size, which may be altogether out of the common run. Beyond singularity of size, many artistic productions, especially in the way of booklets—one of the most favoured forms of modern advertisement—disclose little that demands special typographical skill. The composition and display are in the simplest possible style. Perhaps extreme simplicity is the most striking feature. And yet it is tasteful in the sense of being full of good taste. A well-placed initial, block ornament, or illustration; a width and depth of page to give ample margins, and those margins arranged on the William Morris principle—that is, the right and left margins are each equal to that between the pages—display lines and body type quite plain (certainly readable),

and good press work. Those are the chief points. It is the "artistic simple" of typography.

A good commercial display hand has nothing to unlearn in essaying artistic display. He will find the fundamental principles practically identical. The more prominent additional qualifications involved in artistic display are :—

Taste.

Ability in effective grouping.

Facility in preparing rough typographical designs.

The possession of good typographical taste will take you a long way in the matter of artistic display.

The types, vignettes, initials, borders, and other embellishments that now enter so largely into this class of display are so varied in character that it requires all the taste—the word embodies discernment—that you can command or can acquire to preserve congruity in display. It is a good thing to have so much material, but the wider the range of material with which you have to deal, the greater will be the need of restraint in selection. So much work that is intended to rank as artistic typography is spoiled by the introduction of type faces that are good neither in harmony nor contrast; type faces that are out of harmony with the style of block or blocks used, or by too much ornamentation. Taste will keep you from falling into either of these errors. A sentence in our "Rules for Display" will here bear repetition: "If an ornamental design or illustration is to be used, the character of same influences the type selection. Ornamental and straggling type faces kill the effect of the graceful and flowing productions of the artist in design. The more free the design, the more compact should be the type faces."

A study of the advertisement pages of high-class trade journals will soon give you a fair knowledge of the styles and sizes of display types that combine well.

If you have a tendency to use too great a variety of type

faces or styles of ornament in one job you will need to exercise restraint. Generally the different sizes of one artistic series is sufficient, in combination with types of plain face, for one piece of work. "Display in series" we shall have occasion to deal with at a little later stage.

As we shall see, taste very considerably overlaps the other points in artistic display.

Grouping.—As the term implies, this is a bringing together of words or portions of wording into a width less than the full measure of the job. This does not involve setting the stick for each different width or group of lines. The method is to determine the width, in pica ems, of the respective groups, and in setting the first part space to quotations or metal furniture equal to the width of the second part. For example, the following shows a 14-em measure with grouping of 10 and 4 ems respectively:—

10 ems.	4-em quotation.
<hr/>	
<p>“Practical Printing:”</p>	
	<p>THE CRAFT EDUCATOR.</p>

After the first part has been set and spaced the quotation (or furniture as the case may be) is lifted and the second part takes its place.

One of the great advantages obtained by grouping in display is concentration. The principal item of a job, say, of three or four words, by being grouped in two or three lines in type of average width of face is rendered more forceful than it would be if displayed in a single line in condensed type. The shorter lines and the broader style of type that one is enabled to use make the item more conformable to the eye.

Grouping is one of the chief characteristics of artistic display. In some instances it is necessary, in order to get a successful effect, to change the position of a line or sentence in the copy. Before doing this you should be quite sure that such liberty with the copy will not be resented. There are very few announcements that do not include one or two self-contained items, the position of which does not affect the gist of the work. So that the transposition of such may generally be made to suit the circumstances. The one thing to guard against in grouping is that the proper sequence of the wording is not endangered.

To be symmetrical and artistic, grouping should be done, to some extent, on a system. It is seldom successful if done in a haphazard way. An examination of ineffective grouping generally reveals an absence of plan in the arrangement of the lines and spacing. What we may term non-involved grouping—that is, lines grouped without surrounding matter—as indicated by the following :—

AND AT 109,
Southbourne
Grove, W.

is not much affected by system in widths. It is only necessary to make the words range and avoid very condensed types. But with grouping that involves two or more measures, as here illustrated :—

NEW ADDRESS :

5, Bridge Street, *Nine Doors*
from
Northminster, S.W. *Eastminster*
Bridge
Station.



it is best to adopt, according to the exigencies of the wording, either one-fourth, one-third, a half, two-thirds, or three-fourths of the whole of a measure ; or the nearest to those fractions without dividing picas. Which of these degrees you will use is governed by the quantity of wording, as well as by the manner in which the largeness or smallness of the words will allow the matter to fall in order to catch the eye ; and this, in turn, governs the size and shape of the type that will best suit your purpose.

The above small example illustrates the three-fourths and one-fourth arrangement. The full measure is 16 ems ; 12 ems (three-fourths) are taken up by the principal wording, and 4 ems (one-fourth) by the minor matter.

As illustrating the two-thirds and the half arrangement in grouping the following will be suggestive :—

Jones & Higgins,

LADIES' AND CHILDREN'S

OUTFITTERS,

SILK MERCERS, ETC.



Here an 18-em measure is used. The name is selected to come into about two-thirds of the measure, and the matter following to make about one-half, the latter being placed to fall central from the end of the name.

The first page of the inset further illustrates the principle of grouping in display. Here we have a 24-em measure. The portion down to the line "Specialists" is set in 6 and 18 ems respectively, although the "Court Dressmakers" group shows only a printed width of 10 ems. The two first-named represent one-fourth and three-fourths of the whole measure. The position of the "Court Dressmakers" group also shows method in placing, the space preceding the lines—6 ems—

being one-third more than that—2 ems—which succeeds them. Thus they do not clash in length with the lines above or the lines below the group.

“Specialists in” and the items following are approximately of the one-half order. The placing of the items is on the same method as observed in the group above ; that is (without taking into account the ornament in the second working), 8 ems (two-thirds) precede and 4 ems (one-third) succeed a 12-em group. The last two groups represent the two-thirds and three-fourths arrangements respectively.

Grouping also permits the use of type that in shape accords with the shape of the paper or card used for the work. That is, for an octavo or quarto oblong page, type of square or rather extended face would look most appropriate for the display lines ; and for an upright page—large post or demy octavo, for example—type of a slightly condensed face is best. In ordinary display, in which the lines are centred or full to measure, the use of very condensed and very expanded types is sometimes unavoidable, according as it is necessary to “get in” or “drive out” certain words to fit a given space. Neither of these is good from the standpoint of readability, and it is one of the advantages of grouping that both extremes can be avoided. An item set in two lines of type of square face is more readable than if set in one line of very condensed type. And a short word or item is more pleasing to the eye if set in square or slightly extended face, and placed to the left of the measure, than it would be in sprawling letters.

Designing.—It is universally conceded by those best acquainted with the composition of artistic work that time spent in making a rough working design is time well and economically employed.

A writer in the *Inland Printer* gives the following valuable advice on the matter of facility with the pencil :—

“To acquire the desired skill in handling the pencil we need

not commence in the kindergarten and draw prisms, cubes, and circles. Commence by taking every opportunity to copy faithfully the outline of the different letters in daily use, beginning with those of simple design and progressing to the more intricate. By this means a thorough knowledge of type design is acquired, and we learn to compare, analyse, and classify the type faces, which should be the foundation of all education in job work. While drawing the letters control over the pencil is attained, and we are able to undertake the drawing of ornament. The faithful copying of models quickens our appreciation of symmetry and proportion, helps us to recognise the beautiful and reject the bad, and forms our taste in a proper mould. The artists in designing most of the best type ornaments offered to-day have been influenced by the art of some one period, and if we are but slightly acquainted with the history of ornament we shall be able to use type ornaments more intelligently than if entirely ignorant in such matters.

"Now, the object is not to make poor artists but good compositors, and drawing is but one of the aids to that end. Success in drawing depends upon accurate observation and careful examination, qualities most useful to a printer."

In order to indicate the relation of the rough design to the finished job we give a reduced *facsimile* of a compositor's rough sketch on page 2 of the accompanying inset, and the completed job on the opposite page. Go with us through the preparation of this rough design.

The copy gave no indication of style. It was written in the ordinary way, and the order was for an effective memorandum or letter-heading, large post quarto in size.

"An effective heading." It is possible to obtain this without undue elaboration. At one period of "artistic" display we might have essayed the interpretation of "effect" in piling up a large amount of border or combination ornament of many and minute pieces. The work of the

artist in design has enabled us to obtain effect by more simple means. Besides, we have learnt that it was a wrong typographical principle to construct ornament to the detriment of the message or object of the work, hardly to mention its time-consuming attribute. So we select a large initial and take a galley-press pull of it. We will trim the rough pull and try it for position on a sheet of large post quarto. The quantity of matter to precede and succeed the initial decides its correct position, and then with a touch of paste we stick it down.

Our next point is the series of type faces to be used for the principal lines. It is a wide heading and our initial is of square shape, so it is essential to select a face in due proportion. A condensed face would be altogether unsuitable to both. A 2-line face of medium strength will be large enough for the class of job, and having decided the type we will try, we set the name line and lay it in place on the sketch sheet. It does not reach across the full measure, and the space remaining suggests grouping the calling to follow the name and thus complete the width. We will ink the letters "J" (of John) and "O" (first in Gordon) and stamp them on the sheet, and then put the line on our galley until it is wanted in composition. Before taking the line off the sheet, however, we make a pencil dot to show its extent. From the two stamped-in letters we roughly pencil in the other letters of the name, and also the group of lines that follow the name line. Now it is in order to complete the placing of the wording. The address is the most important of the remaining items, and the space following the name offers as the most suitable in every way. Here we can use the next size of the series selected for our job, and indicate a lower-case line on account of its quantity. The rest does not require much consideration, except that we must have regard to the balance of the job as a whole in its disposal.

A general survey, to ascertain if anything more is required to our rough design before commencing the composition, shows that the appearance of the initial is somewhat naked; and the connection of initial and name, too, is hardly well defined. We will therefore pencil a line radiating right and left from the initial, and other lines to enclose the initial from these—electing to avoid mitres. Why? It will give us a little more freedom in composition, and the corners of the initial are already sufficiently “set” in appearance.

There is still lack of finish. The rule under the initial looks rather too square, and the rule angles too severe. A few pieces of uniform embellishment to round off these points will be an improvement and further qualify the arrangement of the initial. These we select and stamp in, and, the effect being satisfactory, our rough design is complete.

The placing of wording in designing involves taste and judgment; but practice soon enables one to accomplish this with very considerable accuracy and expedition.

In cases where it is not easy to obtain a sheet of paper or a card of the actual size of the job to be designed, the space can be marked off on a large sheet of ordinary proofing paper.

Where an illustration, or block ornamental, is to be used a rough proof should be taken of it. Trim the impression close, and try it on the sketch sheet for position. Its position has to be considered in conjunction with the principal line or lines of the job. If the chief item be also set and proofed it is, in many instances, all the proofing that one requires in the preparation of a rough working design. The two should be tried in position on the sheet until the most effectual and artistic arrangement is gained; they may then be pasted and stuck down in place, and the other portions roughly pencilled in.

Whether a block will require the addition of rule work and embellishment or border to qualify its position depends

on the size and character of the block. The style and quality of the work also have to be considered. If the illustration or design is of a compact description, or has what may be termed a "naked" appearance at the edges, the addition of rule and embellishment will often give a better finish from a typographical point of view. A good effect, too, may be produced by the addition of light border and rule, merely sufficient to give point and definition to the block. But where a block is of a trailing character, or composed of ornaments radiating in all directions, rule and border can well be dispensed with. Such an ornament or illustration of itself supplies sufficient decoration without the addition of other embellishment. It only requires to be artistically placed, and the type portions in keeping, to be fully artistic.

Pages 1 and 3 of the inset to this section, to a slight extent, demonstrate this point. The small block on the first page is of the "free" order that is best left unconfined; while the initial on the third page represents the "compact" order. It will be remembered that in our description of the preparation of the rough design the rules and embellishment were added to tone down the abruptness of appearance.

In making up the rough design the usual method is to pencil in lines to represent rules, and stamp in terminals, embellishment, or border. Two or three pieces of the latter are generally sufficient to indicate the effect.

As far as possible blocks should be appropriate and in keeping with the subject of the work. The type portions, however, are not to be regarded as secondary, the province of the illustration being to increase the effect of the type.

A rough design can be utilised to simplify the making up of jobs for two or more colours. It is generally possible to decide the make-up before composition; so that any block, initial, or line for a second working need not be justified in the key forme. If it be decided to print the decorative

portions of a piece of work in one colour and the type portions in another colour, by working from the rough design the two sections may be set independently and a considerable amount of time saved thereby.

Display in Series.—This is a notable feature in artistic work. It ensures pleasing uniformity without tendency to sameness. Type faces in well-graded series are almost indispensable in the best display. They enable one to interpret an announcement at its proper relative value—even to a nicety. And yet the most striking display can also be achieved from series.

Supposing that for the first, second, and third degrees of importance of a piece of display the 2-line (24-point), 3-line nonpareil (18-point), and pica (12-point) of a series are selected, an excellent balance of value is obtained. In cases where a more striking or arrestive effect is desired it could be obtained by selecting one of the larger sizes of a series for the main item. The class of work always decides the point. Cards, small circulars, booklets, and similar work are generally best served by display of good proportion. Any item of special assertiveness is seldom called for. Three or four of the middle and smaller sizes of a series are sufficient for the leading items of the message. But in displaying large circulars, or advertisements, or any work containing an item or items that should at once “catch the eye” greater disparity is necessary in the sizes employed.

Process in Artistic Display.—The work of the artist and the agency of the camera are very largely requisitioned in modern artistic display. In the way of ornamentals, head and tail pieces, initials, and *facsimile* “bits of Nature,” the printer has some excellent material for embellishment at his command. These, in half-tone and line reproductions, have an important place in artistic work. Many of the photo-engravers’ recent products combine the two styles in one block; such as a half-tone portrait in a setting of

trailing or other ornamental design ; or an initial intersected by or intersecting a photographic presentment of Nature.

It is easy for the compositor to identify the half-tone on account of its mesh. Broadly, half-tones are reproductions of photographs, and line blocks the reproductions of artists' work.

Line blocks and half-tone blocks, or blocks that combine the two, are all suitable for printing on art paper ; but the fineness of the mesh of half-tones renders them peculiarly unsuitable for any other than coated or super-calendered surfaces. Say you have a booklet consisting of an art paper inset and cover of rough surface material. Half-tone or combination half-tone and line blocks would be suitable for use in the inset ; but if a design was required for the cover, a line engraving of not too close—or fine—a style would be best.

Display in sprawling lines is detrimental to the appearance of process reproductions. Neat, simple, and rather compact grouping arrangement gives the most artistic results of block and type, and is much to be preferred from the stand-point of readability.

Miscellaneous Suggestions.—*Locking-up.*—If all compositors understood to what an extent a properly locked-up forme goes in the matter of good printing more would take pains to make themselves masters of this most important of typographical details. Especially in job work, where one has formes of all sizes and kinds, is method in locking-up essential, and the following procedure is neither difficult nor unduly time-consuming.

After you have removed the page cord be careful to see that no letters have slipped or fallen down at the ends of the lines. With your thumb and finger, press the sidestick and footstick as tightly as you can to find that all is square and in order. Then gradually tighten the quoins a little all round. Care must be taken that one quoin is not made

so tight that the others do not act properly. If it is a job requiring the straight-edge or square, now will be the time to use it. Next tighten the quoins a little more all round, and look for any twisting or hanging that there might happen to be. If all seems right, plane down gently and then go ahead with the locking-up until the forme ought to lift. Rather more pressure should be applied from the foot of the forme than from the side, especially with open jobs. Even if the leads are perfectly straight there is always a certain amount of "give" from the foot, and thus more pressure is needed to obtain grip. After locking-up proceed to test if the forme will lift properly as instructed on page 212, and be sure that it is right ere you let it pass out of your hands.

Correcting.—In making corrections in the forme it is advisable to see that lines or words lifted are put back again on to their feet. This should be done with the cushions of the fingers before the quoins are tightened.

Generally.—In the successful execution of job composition, of either commercial or artistic quality, there is always scope for good judgment on the part of the workman. Job composition is not easily confined to "hard and fast" lines; and not one of the least important elements that a compositor should exercise in its technique is a pliable mind.

CHAPTER XLII.

JOB WORK COMPOSITION (*continued*).—Job Work for Colours.

MODERN job work, especially of the artistic class, is perhaps more frequently in one or more colours than in black.

Work for one colour would be affected in display to the extent that faces of medium and full strength would be permissible. This, it should be noted, does not imply larger sizes; but simply that faces of the strength of, say, Jenson—or Venetian—old style look better in colour than lighter styles of type faces. Particularly does this apply to work in colour on rough surfaces. While light faces may look well in some instances, even in colour on art paper and card, they are not successful on antique and other rough-surfaced material.

The fact of a job being in colour is a general indication that it is above an ordinary job in quality. Colour alone cannot be relied upon to make a job. There must be style and skill in the composition. If the compositor knows the class of paper or card proposed to be used for the work before starting the composition, the knowledge should enable him to mould the display so that it is in the main suitable for the material.

In designing his job he should in all cases remember the colours to be employed and use types and ornaments accordingly, for some colours require heavier faces than others.

The Key Forme.—In work of two or more colours the principal forme is termed the key forme. It is the forme
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containing the portions into which other working or workings fit, and the key forme—except where bronze is one of the workings in the colour scheme—is the one first printed. As far as possible it should be arranged for the key forme to contain what may be called “the extremities” of the page, so that the pressman is enabled to readily get it in position for correct margin; otherwise a gauge is necessary to obtain the right position on the sheet. When the portions for bronze constitute a minor forme, the key forme has first to be sent to press for a sufficient number of pulls to be taken for registering purposes.

Except in the simpler styles of two and three colour work, it is usual to first set the whole job in one forme. After proofing and reading, the portions for additional working or workings are marked. These parts are then lifted out and quadrats and spaces equivalent in size inserted in their place. This operation is sometimes termed “dissecting the key.”

According to the intricacy or simplicity of the make-up care should be exercised in spacing and whiting out the parts for the additional printing or printings, as well as in filling up the space from which these parts have been taken. In work involving intricate and close register it is usually best, and in the end saves time, to calculate the lines and leads that fall between the parts and insert their exact equivalents. On the other hand, where the make-up is simple, for the minor formes quotations and metal furniture, with a lead or two—or clump—on either side of the lines, to admit of their being easily shifted if necessary, are time-saving and satisfactory.

So far as the compositor's work is concerned, good and quick register depends chiefly upon the state of the key forme. It is therefore of the highest importance that it should be well justified, perfectly straight, and properly locked-up.

Block or Large Initial for Second Working.—This is the simplest form of two-colour work, and one that is largely and successfully adopted in good class jobs. As a rule, it consists of a block design, pictorial illustration, or large initial worked in a different colour from the remainder. Or the second working may be merely a flower-head or the filling-in part of a two-colour block or initial.

This class of work demonstrates strikingly the utility of a rough working design. As we have already pointed out in our remarks on "Designing," the block or initial for the second working can be decided upon from the rough design before composition, and the latter made more simple by the omission of the block from the key forme. A single block for a second working does not, of course, involve the time of the compositor in getting register, hence the arrangement is economical.

Rule and Ornament in one Colour, Type in another Colour.—As previously indicated, this style of two-colour work may be set in the first place in the two formes from the rough design. When neither part is sufficient to properly indicate the correct position for working, rough proofs should be taken of each. Trim the pulls and paste them up on a "sheet of its own."

Lines and Capitals for Second Working.—The method of justifying lines and capitals for working in red or other colour has already been fully explained in the bookwork section, page 369. To obtain good register with the capital letters of words even justification in both lines is essential. Open capitals, succeeded by letters without ascenders or descenders—for example, a capital "P," followed by a lower case "r"—bear spacing so that they slightly overlap the lower case letter, and this entails due allowance in spacing to preserve an equal appearance between the words.

Two or Three Colour Borders.—The key portion of a close-fitting border of more than one colour requires careful manipulation. If the pieces are not in a perfectly clean state,

correct register is not easily obtained. The compositor should see that the connecting sides are free from grit, dust, or ink corrosion. The forme or formes containing succeeding parts should be surrounded with a lead or clump to facilitate any alteration needed.

CHAPTER XLIII.

JOB WORK COMPOSITION (*continued*).—Diagonal Work—Justifying
Circles to Type—Curved Lines—Borders—Cuts and Vignettes—
General Hints and Cautions on Display Composition.

THERE yet remain a few kinds of work with which the compositor must be made acquainted.

Diagonal Work.—Sometimes matter is so set that a prominent line, generally between rules, runs diagonally across the page from the left corner at the bottom to the right corner at the top, the rest of the lines being horizontal; or it forms a diamond or lozenge, enclosed in rules, or the whole page is set diagonally.

Whatever be the kind of diagonal work, it is necessary first to make of clumps or pica quads a frame enclosing a space the exact size of the page. Fit the frame with metal furniture all round it to keep it together; or, better, put it into a chase and partially lock it up. Then proceed to put your matter inside it.

Suppose you have a bold line between rules, running diagonally through horizontal matter. Set it in your stick, and then place it with its rules in position within the frame, justifying the ends with quads as far as possible, or, what is far better, angular quadrats, such as those sold by Messrs. Caslon and other founders. The openings at the top and bottom of this line and rules are then temporarily filled with metal furniture and spaced quite tight against the lead or nonpareil on each side of the rules—this makes the diagonal line perfectly rigid and the

rules perfectly straight, the chief point to be aimed at in this class of work. This being done, the metal in the *upper* half is lifted out and the horizontal lines set and inserted, and if satisfactory, spaced quite tight, in fact quite finished in that half. Then lift the metal from the *lower* half and finish in the same way. The horizontal lines on either side of the diagonal line will vary in length, getting smaller as they descend on one side and larger on the other. The measure of each must be carefully calculated, and if the use of angular quads is not available, the justification between the horizontal lines and the diagonal rules may have to be effected with quads of smaller bodies; but whenever possible the angular quads should be used, for they fit the diagonal line on one side and present a perpendicular edge on the other, to which the horizontal lines can be justified with the greatest ease. In fact, the angular quads should be put in first against the diagonal line, one under the other, when it will be seen that something very like a staircase is presented by their rectangular edges.

When all the lines of the job are to run diagonally, first insert the central line, which runs from corner to corner, then put in the requisite leads on either side of it, then put in the next longest lines and the leads before (or after) them, and so on.

Setting in a diamond is performed in the same way: you begin with the longest line and work from it either way to the shortest.

Justifying Circles.—When circles have to be justified to type they must be placed in a frame of leads, or quads, which are better, and then the lines of type must be set to varying measures, so that they extend from the frame on the one side to the periphery of the circle on the other.

Curved Lines.—Jobbing compositors were very fond of curved lines of type a few years ago, but they never made really good work, and such lines are now by common

consent avoided. Types, being rectangular, are unfit for curves, for of concentric curves the surface of the inner is shorter than that of the outer, and hence to make a good job types should be wedge-shaped, like the stones of an arch. However, if a customer will have curved lines, the workman can produce them either with the special curved line formers sold by the founders, or by heating and bending leads or, better, brass space lines to the shapes required and using them as line formers. The line of type is to be inserted between these, and the whole justified into the measure of the job in hand.

Having selected the proper line formers, or made them yourself, either with your fingers (by pressing the lead or brass over the handle of a file, or the press handle, or a piece of gas pipe, gradually moving the lead or brass along its whole length, pressing it round as you go) or with the aid of the rule-bending apparatus (described on p. 133), choose a condensed type for the line to be inserted in these and space it as close as possible; spacing between the letters is to be avoided, for it always spoils the effect. Having inserted the line, you will find that the types touch one another on the inner side of the curve, but that on the outer there is a wedge-shaped void between each. These voids must be filled as nearly as possible with spaces of a smaller body, care being taken to introduce them regularly, so that the symmetry of the curve is not spoilt.

In order to make a curved line look really effective it should be supported by a straight line the full width of the job, coming up fairly close to each of its ends, preceded of course by a lead or clump. It should be the effort of the workman to procure this even if he has to occupy the inner arch of the curve with an ornament instead of type. The curved lead or brass touching the inside of the curved line should be cut so as to include the whole of the letters only, allowing the first full length lead or clump to come flush

against the first and last letters of the curved line, thereby allowing the bottom lock-up (presuming the justifying spaces between the top of each letter have been carefully inserted) to secure the curve perfectly rigid.

When line formers are used, the line can be readily justified against the brass stops shown in the diagram; but if leads be used, a more or less awkwardly shaped space has to be filled up at each end. The objection to line formers and curvilinear furniture is that it is rarely the exact curve you want, that it takes up too much space, and that it keeps the surrounding matter too far away from the curved line itself.

With a serpentine curve the difficulties of spacing and justifying increase with every turn of the curve; but the more condensed the type used the fewer the difficulties met with.

Borders.—Though borders are by no means so fashionable now as they were a few years ago, fashions change so mysteriously and often so rapidly that we will devote a short space to the subject.

Borders may be divided into three classes: (1) line or rule borders, (2) repetition borders, and (3) combination borders.

Line or Rule Borders are made with brass or metal rules. They are either quite plain, and of thicknesses of a nonpareil and under, or compound, and of thicknesses up to two-line pica or even more. The former kind are made with the ordinary brass rules, specimens of which are found on p. 124; the latter are usually made with the combination brass rules invented by Mr. Pechey, the London representative of Messrs. Stephenson, Blake, & Co.


In dealing with plain rule borders the main things the compositor has to see to are that the rules are exactly of the lengths required, and that the corners are properly mitred. When corner pieces are used it is necessary to

cut the rules so that these join on to the corner pieces without showing the join. As this can seldom be done satisfactorily, the expert compositor generally prefers to make his own corners, *i.e.*, to mitre them.

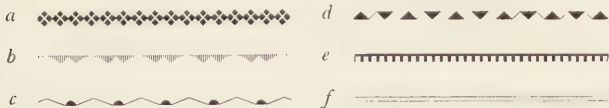
The task of mitring a set of rules so that these may join true at each corner and thereby present a perfect frame round a page or an ad. is no easy one. Although in these days of labour-saving rule, with mitred pieces supplied, the necessity of using a file is not so frequent as it formerly was, still, there are many occasions even now, and in the most up-to-date offices, where a single set or a great number of sets of rule are required to be mitred to meet an emergency. The most skilful man at the work is then eagerly sought after, as the job must be done without any faults or any waste whatever. The principle of all mitres for rectangles is that the rule must be filed to an angle of 45 degrees. To get this angle, measure from the end of the rule on one edge of it a distance exactly equal to the thickness of the rule, then draw a line diagonally across the face from that distance to the nearest corner and file away to that line, and a perfectly true mitre will be obtained. Very few offices have mitring machines, and an expert workman will do the work quite as well by laying the rule on his lower case and allowing the end to be mitred to project half an inch over the quad box. Holding it tightly down to the flange of the case with his left hand, he can very quickly, by means of a good file, produce a set of mitred rules. A medium-cut file is necessary for brass rule, and a fine rasp for nonpareil to pica metal rules. The lower edge of the mitred end should be filed off a little more than the surface edge so as to help the two ends to join better. The burr that is seen on the surface of the rule after the mitring has been done should be carefully removed by means of a finer-grained file.

It not infrequently happens that rule has to be mitred to

a different angle from that which has been described; as in the case, *e.g.*, of a long diamond. Here it is best to file a small amount from each pair of rules, and fit them together in their proper position on a galley, taking a little more off each until they join perfectly. After a little practice and a good deal of patience a careful workman will soon become expert at mitring rules of any size and for any angle.

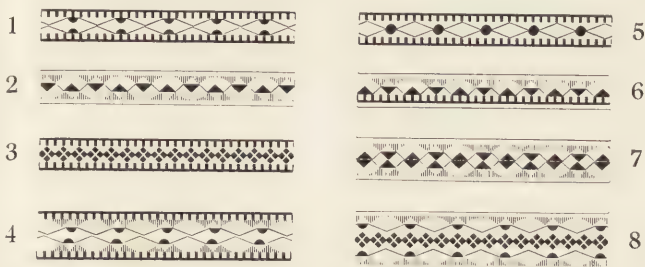
 *Oxford Corners* are supplied by the foundry, and when these are used they are supplemented by pieces of rule fitted to them. They can, however, be made by the compositor in two ways: (1) By cutting the two *down* rules to the full length, and the other two just sufficiently long to meet them, and then cutting four small pieces to the length of a pica, or three nonpareils, or two picas, according to the size the Oxford is to be, to complete the crosses, adding them in their proper positions and justifying them with quads. Whatever size it is decided to make the Oxford, quads or furniture to that amount should run all round the outer edge of the rules, an *em quad* of the size thus falling between the overhanging rules in each corner. (2) By taking rules throughout of the full lengths required and with a thin file cutting slots in them, slightly more than half-way through, the slot as to two of them being commenced at the bottom, and as to the other two at the top, and then fitting or mortising them together.

Combination Rules.—A few of the combination rules are shown below:—



The number and variety of borders which may be made

by judicious combination of a few simple designs like the above are very great, and a few are shown below:—



Nos. 1 and 5 are combinations of *e* and *c*; Nos. 2 and 7 of *b*, *d*, and *f*; No. 3 of *e* and *a*; No. 4 of *e*, *b*, and *c*; No. 6 of *b*, *d*, *e*, and *f*; No. 8 of *f*, *b*, *c*, and *a*. It will be noticed that these designs at once suggest others, which may be made by addition, subtraction, or transposition; indeed, the permutations from these six rules are practically unlimited. There are a great many other patterns supplied from which may be obtained by judicious and tasteful combinations an infinity of designs. They were exceedingly popular a decade ago, but now are supplanted almost entirely by the beautiful labour-saving series with plain and ornamental faces.

Combination rules, when used as borders, require corners, which must be obtained from the foundries, or the rules must be mitred. Where corners are obtained, rules cut to the following ems, as nearly as the pattern will permit, will form borders of all the regular sizes of jobs, from a small card to demy 4to, generally without piecing:—

3, 4, 10, 12, 17, 18, 20, 22, 24, 26, 35 ems.

Angle Work in brass rule can often be neatly and solidly done by taking a piece of rule and scoring and then bending it at the places required. This often makes a better job

than putting together several pieces of rule. The scoring can be done very effectively with a three-cornered file.¹

Repetition Borders are borders in which the design is comparatively simple and is constantly repeated.

Combination Borders are the more elaborate borders, made up of many parts, cast as separate types, and combined together according to the fancy of the compositor.

Examples of all these kinds can be seen in the type-founders' specimen books. Some extremely elaborate and often very beautiful kinds were some years ago introduced from Germany, and were very popular, though they are now less favoured.

Whether to have a border or not, and if so, what, are questions the solution of which makes large demands upon the printer's taste? In the "eighties" very few jobbing printers could resist the temptation of using borders and ornaments whenever opportunity occurred, but more recently it has been recognised that very often better effects can be produced by the omission than by the inclusion of these designs. Beyond saying that no bordering should ever be used unless there is plenty of white space on all sides of it, and that whatever border is chosen for a job must be consistent with the matter it is to enclose and the style in which that matter is set—light borders being appropriate to light type-faces and *vice versa*—we shall not pursue the subject of taste, but shall proceed to a few technical instructions in the mechanical treatment of borders.

Justifying Borders.—It is of the very first importance in setting any type-border that it be justified with absolute accuracy. If the line of border be too long and loosely fits the matter it surrounds, there is danger that when

¹ The printer who does much ornamental rule work will find it advantageous to procure a small vice, several pliers, a small hammer, and other tools used by metal workers.

locked up the forme will not lift, and even if it can be safely conveyed to the bed of the machine, there is always the risk of the loose types within the border being drawn out by the rollers. On the other hand, if the border lines be not long enough, etc., they will be loose and the various types comprising them will soon get off their feet, with disastrous results to the beauty of the work being executed and to the border itself.

It is often by no means easy to justify borders accurately, and leads and card of various thicknesses have to be employed for the purpose. This is mainly due to the want of system in the bodies of types, and therefore when types and rules cast on the point system can be employed together the labour and anxiety of the compositor are both distinctly lessened.

Make-shift Borders.—In small offices, where borders are, as they should be, very sparingly purchased, it sometimes happens that a customer insists on having a border when the printer has not one to give him. In such cases very passable borders can be made up with plain brass rules, combined with asterisks, colons, full points, leaders, parentheses, em rules, hyphens, and permutations of these, and even with certain letters and figures constantly repeated.

The Use of Woodcuts, Half-tones, and Vignettes.—Woodcuts, half-tones, and vignettes often add greatly to the beauty of a piece of job work, but they require to be used with great judgment. If they cannot be distinctly appropriate to the letterpress—and such appropriateness should always be aimed at—they should at least have a neutral influence and must never be included if inappropriate. For instance, no one must perpetrate such crimes against artistic taste as to place a winter scene on a catalogue of summer costumes, or a convivial party *à la* Jan Steen on a temperance programme! A block should never be selected merely because it is fantastic if artistic

effect is to be produced. An advertiser may like such a thing and ask for it, but a true artist-printer will never suggest it.

As to the placing of cuts and picture blocks, what was said on the subject when dealing with bookwork applies equally to job work, and we refer the reader to p. 340.

Mr. De Vinne advises that in all work for which 'nice or complicated ornament is desired, the setting up of the words should first be done, and when these are so arranged that they fairly show the subject-matter, a proof should be taken. On this proof, hand impressions of such ornaments as are thought desirable may be made. When suitable ornaments have been selected, they should be justified with the text; time should not be wasted in slowly justifying ornaments to letters before it is known what the effect will be. On no account should a line be shortened or crowded, or reduced or increased, leading to the injury of neat display, simply for the purpose of getting in an ornamental block.

General Hints and Cautions on Display Composition.—

We will conclude this chapter and the subject of Jobbing Composition by giving a selection from the writings of masters in the art of display culled from American sources.

Mr. W. J. Kelly says:—

“The compositor should possess some degree of knowledge as to—

Size, Contrast, and Shape.

In these three essentials is the marrow of success in artistic composition. There are many styles in which a neat compositor can show his ability; but in all of these, correct spacing and display are indispensable.

“By *size* is meant, the quantity of space a job is limited to occupy, together with the depth, length, and face of type used in covering this quantity of space. By *contrast* is meant the combination that the entire mass of type used in the job will produce, so as to give a harmonious appearance. By

shape is meant, the grouping of all the sizes used, so as to form some satisfactory design. Everything under these three headings should look as if they were connected in their combination and devoid of incongruities.

“ If a compositor does not possess these qualifications, he cannot succeed in pleasing himself or others. He should in each case compel himself to carefully glance over the matter to be composed, and to consider the result most appropriate to the matter.

“ The secret of display is not in showing a mass of all kinds of plain or fancy faces ; for neither a large nor varied assortment of type will make a handsome job, especially if it lacks sufficient white surface to relieve the eye and give perspicuity to the lines of type. Take, for instance, a job set up in antique, where the main line has been set too large for the dimensions of paper selected, and the other lines are jumbled up in the same regardless way, so that there is hardly a catch-line, or room enough left for more than a couple of leads between each line. True, every word is there in solid type, but can the job be read as advantageously or with as much pleasure as if set up in smaller type, with the catch-lines well reduced in size, and put in some lighter style of face, and the different long lines well separated by white spaces? We think not.

“ The main display line should be selected first, and it should be of such a character as will be in unison with the text of the job. The secondary lines should be used for harmony with the first. The catch-lines should all be considered according to their importance and effect, with all that go to make up the leading features of the text. Of course the selection of the minor lines of display will be found the most difficult task, both as regards the size and kind of type, as well as the exact words to utilise in the lines. But, to the compositor who will follow the above suggestion relative to acquiring a knowledge of size, contrast,

and shape, the perplexing things will become remarkably easy."

Another writer in the American trade press says:—

"In planning displayed work, let each display line have about it a relief of small text type or of white space.

"Where a very bold display is wanted in a crowded space, the text letter should be small bold-faced type.

"When the copy for the text is scanty, set it in a fat or extended letter.

"Where a great quantity of matter has to be got on to a large page with much display, it is desirable to put some of the text—especially if it can be set in small type—in half-measure, or two columns. If the type must be very small and the page wide, three or more columns may be made of a portion of the text.

"If possible a solid text type should never be set to a measure of more than fifty ems of the type itself. Long lines are difficult to read.

"Never crowd a long line of words marked for prominent display in one line of type, if to do so, condensed, or not easily read letter, has to be used. The words may be put in two lines of the same size and style of type.

"Large types must not be huddled together.

"A line should never be shortened or crowded, or the leading reduced or increased—to the injury of neat display—for the sake of getting in an ornament.

"In open display work, like book titles, and in headings of chapters of wide-ledged matter, hair-space lines of capitals where it can be done without causing the lines to over-run.

"Display lines of close-fitting capital letters will often need special spacing when used with solid matter. The meeting letters I and H in sans-serif are too near; the letters L and Y, or P and J in Roman are too far apart. It will often be found necessary to unequally space letters, in order to make them seem at equal or proper distance apart.

"In all kinds of composition in capital letters, an endeavour should be made, by judicious spacing, to keep the stems or thick strokes at uniform distances from each other. A proper spacing of *letters* is as necessary to produce a good effect as the proper spacing or whiting out of *lines*.

"It is the safest thing to do to select small type for the text of a job that is to have plenty of display. Much time is wasted, and the effect spoiled, by selecting for the text a type so large that there is no room for display or for the necessary leading.

"Short pieces of text that may make three or four lines should, in display work, seldom be set in paragraph style, with a paragraph indentation at the beginning.¹

"A full line should not be put at the head of the matter and next to a border.

"When the display is open, like that of a book title, there being more space than matter, a single text line should never be a full one—that is, to the extent of the measure. Two short lines should be made of the text words, the second line being shorter than the first.

"Type with large shoulders and long ascending and descending letters, such as scripts, should not be used on any work in which the space is contracted, and which does not allow a liberal amount of 'white.'

"If possible, a type that can be leaded should be selected for the body of the text. A dozen lines of leaded long primer are more readable than sixteen lines of solid small pica.

"If more lines in the copy are marked for special lines of display than can be put in the space allowed, and if these lines consist of a few short words, they may be set up with

¹ We would amend the text by substituting "never" for "seldom," and by adding after "beginning" the words: "unless they are set to narrower measures to balance other sections, when, of course, they appear 'grouped.'"

the prominence desired, but justified, some in the centre of the text, or as side-heads with text about them.

"Many of the most striking examples of decorative printing are achieved by the simplest means. Hence it is a good rule always to use ornaments and ornamental letter sparingly, even in ornamental work. They are not ornamental when used in excess or inappropriately. And it should never be forgotten that legibility, as a rule, is wanted oftener than ornament. Plain faces have more admirers than fancy letters."

A third writer gives the following rules :—

1. A restful effect is always pleasing.
2. "Plenty of air" should be given to a job—there should be sufficient "whiting-out." This ought never to be sacrificed to get in fancy letters or pieces of ornaments. Cramming into a job all that it will stand is a prevailing bad habit.
3. It is a cardinal point to be observed, that the instant either ornament, spacing, or colour is permitted to intrude upon the perfect legibility and proportion of the reading lines, a law is broken which is independent of all mere questions of taste.
4. Too many styles of letters should be avoided.
5. Ornaments are to be used only to grace the letter, not to draw the eye away from the reading matter. The architect's rule is here applicable: you may ornament construction—you must not construct ornament. Hence repression of ornament is often desirable.
6. Subsidiary ornaments or lines must never be brought into conflict with the chief line or lines.
7. Truth of construction must be strictly maintained. Preserve the strength of different parts—arches should not spring from nothing.
8. Head and tail pieces must not be too bulky or too prominent.

9. The centre of a job must not be weakened and sacrificed to the ornamentation of the border. Sometimes this is done by printing in an injudicious colour.

10. Consistency throughout is a great recommendation in a design.

If a *bordering* is to be used, there are many important considerations to be remembered. It may beautify or entirely destroy the effect of the job. Hence :—

11. The border must not dominate the text.

12. The bordering should not be overdone ; especially the inside margin must not be stinted in order to include a mass of ornamentation.

13. When bordering goes round a picture, an unusually large margin is required ; otherwise the effect of both will be injured. Absurd combinations, such as façades and pillars resting on nothing ; land animals in the water, and such monstrosities as the “Japanese” combinations in vogue some years ago must be avoided.

14. Correct length of lines and spacing between lines are indispensable if the effect is to be symmetrical.

We conclude with the following sage advice from another trade writer :—

“The ability to determine quickly and correctly what type is most suitable for a given purpose is one of the qualities which characterise a good workman, and it is only attained after long practice and much perseverance. To be able to do this saves much valuable time, and it enables one workman to do more and better work in a given time than one who is obliged to work mainly by the ‘cut and dry’ rule. And the work is done with much less worry and exhaustion.

“A good printer, when given a piece of display work to compose, will mentally arrange the different parts and the intended striking features before he touches a type. This takes but a few minutes’ time of one who is well acquainted

with the capacity of the office in which the work is to be done, but it is the means of materially shortening the time required for each job. It does not require any great mental effort. It is only necessary to practise it a little, and then give it your entire attention for a few minutes. After it is done the work may be finished without much mental effort, because the workman only needs to follow the pattern in his mind, visible only to the workman himself.

“ Every specimen of printing that comes within our reach should be looked over carefully, and any errors or merits noted, and a reason assigned for our opinion of them. Valuable lessons may often be learned from poorly arranged cards, circulars, posters, as well as from those in which good taste has been displayed in their composition. Faulty work sets us thinking how we would have done the same thing—much quicker than will work that has been well done. How many outrages of good taste have we mentally corrected as we walked along the street and had our attention called to them by their appearance in windows and on hoardings; or, at least, we thought our ideas were much better than the ones we saw expressed before us! By looking over and comparing the work of others with our own, we may often discover defects and errors that would otherwise escape notice. A studious printer need never look for specimens. There is not a day in which he cannot obtain something in his line that contains an idea worthy of notice.”

CHAPTER XLIV.

MUSIC PRINTING.—Different Methods: Pewter-plate, Lithographic, Typographic—Advantages and Disadvantages of each—The Musical Symbols and their Meanings—A Fount of Music Types—Uses of the several Characters—Gregorian Music—Tonic Sol-fa Notation.

THERE are three principal methods adopted at the present time for reproducing musical compositions. The first is to *draw them on prepared lithographic paper* and transfer them to the stone. The second is to *engrave them on pewter plates*—which are used on account of their greater softness and facility for working, as compared with other metals—and then to take a lithographic transfer, which is laid down on the stone. For the first method a pen and a ruler are all the appliances necessary; for the second a number of tools are required, consisting of straight-edges to rule the lines perfectly parallel, and gravers to incise them. The several notes are not cut, but *punched* into the plate by steel tools of the appropriate shape, and mallets of various sizes. The latter method is carried on in London by a class of artisans who make a distinct trade of it; they do not undertake any other kind of engraving. The third method is *the typographic one*, which we are about to describe.

In regard to the comparative advantages of the three methods, it may be remarked that some professional musicians prefer the pewter-plate prints, as they are more easily read than any others. They do not present that crowded appearance which is often the characteristic of type-music.

This latter objection, however, can be easily obviated, and this kind of print made as plain, open, and legible as the other. The confusion arises from the mistaken policy on the part of the publishers, who crowd as much as possible into a given space, regardless of appearance and ease in deciphering. This system undoubtedly brings type-music into disrepute, and it is probably quite unnecessary, as there is reason to believe that purchasers would prefer, for a given sum, a smaller quantity of music plainly and explicitly set out, than a larger quantity crowded together and extremely unpleasant to read.

There is also about pewter-plate printed music a freedom that cannot be imitated with movable types. A page may be made "like a picture," as it is said; the slurs, the grouping of the notes, rests, etc., can all have an artistic effect given to them which the worker in rectangular types cannot hope to accomplish. On the other hand, whenever the text has to be introduced—the words of a ballad or an opera, for instance—the letterpress printer has the advantage.

In many of the large offices in London and the country, music composition is regularly done, but in the metropolis it has been made into an independent department of the printing business. There are offices which undertake hardly any other kind of work. If the manager of a periodical desires to give a page of music, he sends the copy to one of the music-printing establishments, and in due time receives back a stereotype or electro plate, which he can work with the rest of his pages, just as he would a cast or an engraving. The fact of the demand for music work being altogether beyond the means of supply originally called this trade into existence. No ordinary compositor can set up music without some previous training and considerable instruction, and the advantage of these separate offices is that they have always at hand a body of experienced and proficient hands—men, indeed, who do little else.

It will, of course, be understood that in this branch of skill, as in all others, proficiency is only arrived at by practice; and the most careful perusal of this chapter will never make a music compositor. By perseverance, however, any ordinary compositor may, if he carries out the following directions, undertake music composition in a comparatively short time.

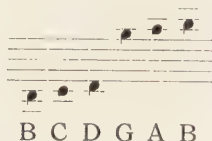
Some knowledge of music is essential to the proper execution of this kind of composition. It is impossible to set up any piece from manuscript unless the meaning of the musical phrases and the time value of the notes and rests be understood. We propose to begin with this elementary kind of instruction; omitting everything that, however important to the musician, is unnecessary to the compositor.

The first thing to be learned is the alphabetical *names of the notes*. They are as follows:—

Treble Notes.



These five parallel lines form the “stave.” When there are higher or lower notes in the composition than can be represented on the staff, additional and supplementary lines are added, called “ledger” lines, thus:—



The *Bass* notes are thus named:—



It will be observed that all the notes are either intersected by one of the *lines* of the stave or occupy the *space* between two lines. They are distinguished accordingly as "line notes" and "space notes."

The next thing to be learned is the *value* of the notes. There are seven kinds of notes used, *viz.* :—



1. The *Semibreve*, a white note.
2. The *Minim*, a white note with a stem.
3. The *Crotchet*, a black note with a stem.
4. The *Quaver*, with a transverse line to the stem.
5. The *Semiquaver*, with two lines to the stem.
6. The *Demisemiquaver*, with three lines to the stem.
7. The *Semi-demisemiquaver*, with four lines to the stem (seldom used).

Besides these there are



The Breve



The Long Breve



The Large Breve

These types were almost discarded until the revival of Gregorian music in the Anglican Church caused their renewed use.

The value of the notes is the duration of time over which they extend; that is, the length of the musical sound that they indicate.

The following is the musical "time table" :—

One semibreve equals two minims; one minim equals two crotchets; one crotchet equals two quavers; one quaver equals two semiquavers; one semiquaver equals two demisemiquavers.

The following diagram will show this perhaps more plainly. It gives the equivalents of each of the notes; so

that whenever one occurs in one stave the corresponding stave must be filled up by notes of the value represented between the perpendicular lines:—

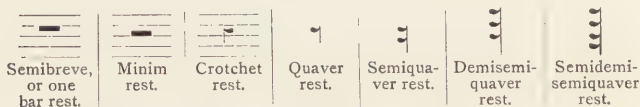


In setting up music, then, in which there are more than one stave, the notes must range over each other perpendicularly down the score. Thus, if there be a minim in the top stave, space must be left after it equal to what will accommodate its equivalent in the other staves. Thus:—



Here the lower stave contains two notes, while the upper contains but one; yet the length of the two staves must be exactly equal. This is the reason why the compositor must understand the value of the several notes.

Besides the notes there are *rests*, indicating pauses, which must range in like manner. They are thus named:—



The notes, with the exception of two, consist of two parts, the head • and the stem |.

The stems of the notes may be turned either upwards or downwards, as may be most convenient in placing them on the stave.




In instrumental music tailed notes should be connected together in groups of two, four, or eight, so as to be more easily read, as shown in the annexed example:—



but in vocal music the tailed notes are separate or joined together, according as to whether one or two notes are required to be sung as one or two syllables, as—



as the as

The strokes    etc., placed over a note, or printed across the stem of it, show accordingly that it is to be divided into quavers, semiquavers, and demisemiquavers respectively.

The following are the significations of the miscellaneous symbols indicated. A treatise of some considerable length

UPPER CASE.

[illegible]

LOWER CASE.

[illegible]

Back of
Foldout
Not Imaged

might be devoted to this subject, but we must confine ourselves to the signs that it is necessary the compositor should understand:—

$\overset{3}{\frown}$ $\overset{5}{\frown}$ etc., marks placed over groups of three or five notes indicating that three notes must be played in the time of two; five notes in the time of four, etc.



G clef



F clef

Clefs.—These signs are always made in one piece.



C clef

also called the tenor clef.



flat.



double flat.



single flat.



sharp.



double sharp.



single sharp.



natural.



or



repeat-dots, used when a strain is to be repeated.



common time.



time signatures.



the staff.



the bar.



double bars.



close; sometimes printed thus:



g ; repeat.

Little notes like ♪ or ♩ are called appoggiaturas or grace notes.

\sim turn.)^{-} inverted turn. tr thrill or shake.

$< < <$ or ~~~~~ vibration. $\text{)}_{\text{~}}$ arpeggio.

⌒ pause. — organ tone.

≡ crescendo. ≡ decrescendo.

|| swell. ≡ increase and decrease.

> sforzando; written also ^ or v

! staccato. — slur or bind. { brace. w direct.

* ⊕ or + (in pianoforte music) use the pedals.

* Used after the preceding to denote a discontinuance of the pedals.

□ or ^ (in violin music) a downbow or an upbow.

Δ a phrase. □ a section. ○ a period.

(Some composers use the ordinary marks of punctuation instead of these last three signs.)

f forte. *ff* fortissimo. *fz* sporzando. *m* mezzo.

mf mezzo forte. *p* piano. *pp* pianissimo.

ppp very pianissimo. *rf* rinforzando, the same as >.

sf sforzando.

Most of the letter-founders supply music types, and their systems unfortunately differ somewhat. We adopt that of Messrs. P. M. Shanks & Co. for the purpose of explaining the method of music composition. Any one conversant with it will experience no difficulty in working with other founts.

The accompanying illustration shows the "lay of the case" for music.

On account of the immense expense of cutting punches for a fount of music there are not many sizes cast, the most usual ones now made being *semi-nonpareil*, *gem*, *diamond*, and *ruby*. The number of sorts to each fount varies considerably, some founts having between 300 and 400 different stamps, others not nearly so many. In some founts a note may be in one type, in others several types may have to be lifted to make the same note. This will be exemplified when we explain the number and use of the various pieces. We will select, as being the most in use, what is known as the diamond 1½ em fount of the foundry named.

All the pieces of a fount of music are cast to the en, em, $1\frac{1}{2}$ -em, etc., of its own body. This is necessary to secure exact justification.

We will now go through the different characters *seriatim*, stating their respective names and uses.

●—“Single line note head.”

Used as the top line note of a chord, or the one furthest from the stem, as



●—“Single line 2-em note head.”

The difference between the two is that the last has an en rule attached to it.

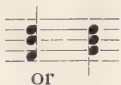
●—“Single line $2\frac{1}{2}$ -em note head.”

This has an em rule attached to it. The two last named are rarely used, as they are almost impracticable, and serve chiefly to increase the number of sorts, which are already numerous enough. It is found, also, that the en and em rule attached are especially liable to damage before the rest of the stamp is injured, and thus the whole is rendered useless.


These stamps may be single or double body; that is, one or two line characters.

●—“Single body line continuation note head.”

This is $1\frac{1}{2}$ em in dimensions; it is used for any of the inner line notes in a chord, nearest to the stem, as



The stem is formed by using a character thus | , consisting




of a single line. It is two bodies, or two-line in depth. If used in the stave, it has the stave line attached to it, as  and is of various widths, 1 em, 2 em, $2\frac{1}{2}$ em, and 3 em.

The spaces between the notes are rules of single and double body, and of various widths, from one en to four or five ems, such as

— and 

It follows from the preceding, that in determining what space there should be between one note and another, it must be always borne in mind that *the longer the stem used the shorter the rules must be*. For instance, if notes in a line stand four ems apart, as



a "double body 4-em rule"  is placed between the note heads, and between the stems a "double body 3-em rule" . But, on the same principle, " $2\frac{1}{2}$ stem"  must be used to make up the deficiency, that is, $1\frac{1}{2}$ to cover the note head, and the remainder to add to the 3-em rules.

● "Double body line note head."

It is used with stem as



and is $1\frac{1}{2}$ em in dimensions. Care must be taken that the longer the stem that is used, the wider the rule must be in proportion to the space between the notes.

■ "Double body space-note."

Also $1\frac{1}{2}$ em in dimensions. It is used thus:—



■ "Continuation space, $1\frac{1}{2}$ em," used as



In this instance it is nearest to the stem.

■ "Double space continuation,"

3 bodies in depth and $1\frac{1}{2}$ in width. It is used as in this case :—



Two "line" and two "space" note heads are cast in one piece, as ■ or ■ or ■

Line-note ■ and stem □ (double body) in stave, as—



Line note ■ (single body) and stem | (double body) out of stave, as ■

Space-note ■ and stem □ (double body), as—



or, out of stave ■ and the piece | forming ■

□ A "line stem"; □ a "space stem." It will be noticed that the line stem does not extend below the bottom line, while the space stem has as much below the bottom line as above the top line. This is necessary in order that the length of a space-note stem should be the same as a line-note; for, if we examine a double body line-note, it will be seen that there is a greater length of stem attached to it than there is to the space-note, so that the space-stem requires to be no longer to make up for the deficiency.

♩ “Unison space-note,” used with stem up and down, as—



It is equal to two bodies.

♩ “Unison line-note,” used with stem up and down, as—



It is equal to one body.

When a note falls on the centre line, a stem is used \perp with only one stave line. It is called a “B stem,” or “cut stem”:—



With a space-note following in the second space, having its stem down or on the third, with space-stem up, as—




the “C stem” is used.



The unison line-note is made with ♩ (one body note head) $\text{---} \text{---} \text{---} \text{---}$ (T pieces) according to the width required, and \perp (B stem) or $\text{---} \text{---} \text{---} \text{---}$ (stave stem). The following examples will show the use of these pieces:—



At *a* the pieces used are ♩ $\text{---} \text{---} \text{---} \text{---}$ (B stem), both the up and down stem being made with exactly the same pieces; at *b* the pieces are ♩ $\text{---} \text{---} \text{---} \text{---}$ for the up stem, and $\text{---} \text{---} \text{---} \text{---}$ (C stem) for the down one.

Notes out of the Stave.—Such notes as  are called “D notes;” they have the usual space stem, as—



Notes of this shape   are called “B notes,” and have “white stems,” or stems without stave line, attached to them | . They are used as in this instance:—



As the notes stand in the same position as those called D notes, it may be asked, why call one D and the other B? The answer is, that this is done simply to distinguish them, and not because any position they occupy would denote them as being D or B in the treble clef.

There are distinct characters used for making space chords in combination to any extent. In this example



the necessity for such notes will be seen. The following are the characters used:—



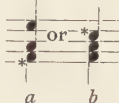
No. 1 is the top note of the chord if out of the stave; No. 2 is the top note if within the stave; No. 3 is an intermediate space continuation chord (as many of these may be used as is needed to complete the chord); No. 4 is used next to the stem and joins it.

The examples *c* and *d* are similarly constructed to *a* and *b*, but inverted, to show the use both ways.

♯ This is a combination of ♯ and ♯, and forms the two top notes of a line chord.

♯ This is a combination of ♯ and ♯, and forms the two top notes of a space chord.

♯ This note must not be mistaken for the D note ; it has a different use assigned to it. If the character is examined, it will be seen that it is kerned, or cut away, underneath the black part of the note, so that when placed as in the following chords it overhangs the note next to it.



The notes marked * are the kerned notes.

When two ordinary space-notes are placed head to head as—



it will be seen that there is still a full space between them, but if a kerned note is used, the notes appear in the next spaces to each other, as ♯. This is a combination which has lately been cast in one piece, occupying three bodies in depth, and is very useful in short score, as it obviates the use of the kerned notes, which are liable to get broken.

Short Score is where the four voice parts are compressed into two staves—treble and bass. It is much used in hymn books and similar publications in which economy of space



is important. The compositor should notice at the points marked *a*, the use of the 3-body double space-note stems up and down.

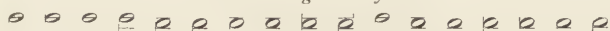
■ ● These are used for backing notes, as



The first one forms the note A in the first chord ; the second is for G in the second chord.

The black notes are $1\frac{1}{2}$ em in width, the white notes 2 ems in width. The white notes are worked in precisely the same way as the black notes.

White notes generally used.



White notes with reversed stems.



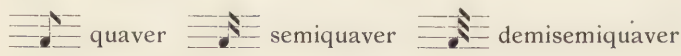
These types are used where stems are required for the opposite side. The notes, however, are so seldom used that the type-founders do not supply the characters unless specially ordered to do so.

We will now proceed to explain the use of the quaver, semiquaver, and demisemiquaver tails and binds.

When the stems of quavers, semiquavers, and demisemiquavers are turned upwards, they are first made exactly like crotchets :—




and then the tail is added at the back of the stem to denote its value, thus :—




but when the stems are turned downward, the tails join the note heads at once, without first being formed like crotchets.

The following pieces are used to make these notes :—


For a line or space quaver with a stem up, this piece  is

used to "back" the stem—turned one way it joins a space stem, inverted it joins a line one, thus :—




For a line quaver with a stem down, this character  is used to join the note head, thus :—



For a space-note with a down stem this piece  is used, thus :—




For a line semiquaver with an up stem, this piece  is used, thus :—




and for space-note, this character  thus :—




For the down stems, a line semiquaver is made with this piece , thus :—




and a space one with this , thus :—



The demisemiquaver line and space tails are made with the same piece, namely , thus :—



Both the down stems of line and space demisemiquavers are also formed with one character, , and are made thus :—



When the stem appears out of the stave, tails must be used which have no stave lines attached to them, ✓

This piece is used for a space quaver with a stem down, thus :—



and this one ✓ for a line-note



In this instance a single-body line-note must be used, and a "white single-body stem," so as to make the stem the required length.

The quaver tail for an up stem is also cast without a line ✓, to work out of the stave.

In instrumental music, two, three, four, or more notes are often grouped together, according to the time in which the music is written, as—



In such cases the following pieces are used :—

- - - - -	for line notes	} if quavers ;
┌ ┐ ┌ ┐ ┌ ┐	for space notes	

≡ ≡ ≡ if semiquavers ; ≡ ≡ ≡ if demisemiquavers.

Of these pieces the quavers occupy one body only, and the semiquavers and demisemiquavers two bodies ; therefore, as each note and its stem should take up four bodies, the quaver requires a "T piece" placed in between the note and quaver bind to make it the requisite length ; this is when all the notes of the group are alike, as at *a*. When, however, the notes are different, as at *b* and *c*, the note nearest the stem, that is, the highest note when the stems are up, and the lowest note when the stems are down, takes

its proper length of stem, and all the other stems are lengthened by "T pieces" to join the bind.

The above binds are used only when the groups are all in one position, thus:—



a

or, when the notes run up or down and return to the starting note, thus:—



b



c

We think the explanations given will enable the compositor to form groups or notes which require *straight* binds; but, when the notes run up and down, each note being one degree above or below the preceding one, as in the following example, different characters are required:—



We will now proceed to explain the use of the *up* and *down* binds. The sorts necessary are—



These pieces are cast in various sizes, ranging from $1\frac{1}{2}$ em, the width of the note heads (which necessitates the notes for which this piece is used being close together), to 5 ems, which size admits of $3\frac{1}{2}$ ems of blank rule or space being placed between the notes. When more space is required between the notes, two or more pieces must be placed end to end; thus, for instance, supposing we have $6\frac{1}{2}$ ems between two quavers, we must use two 4-em pieces together to make the 8 ems— $1\frac{1}{2}$ em note head and $6\frac{1}{2}$ ems between, and so on.

We must now explain the separate uses of each of these pieces. There are five sizes of the first of these characters, which always *cover line* notes.

1½-em 2-em 2½-em 4-em 5-em

They are used where two or more notes are placed as in the following example :—



In this case a space-note commences a group. The bind covers a line-note. So that when a group of notes commences with a space-note and proceeds regularly up the scale, any one of the above characters, according to whether the music is set close or open, should be used as the *first* bind.

We now come to the up quaver binds to *cover space*-notes. They are as follows :—

1½-em 2-em 2½-em 4-em 5-em

These are intended to commence a line-note and cover a space-note, as



There are also down quaver binds to cover space-notes, as



1½-em 2-em 2½-em 4-em 5-em

The down quaver binds to cover line-notes, as



are the following :—

1½-em 2-em 2½-em 4-em 5-em

The semiquaver and demisemiquaver characters are used in a similar manner to the quaver. There are not so many

sizes of these pieces as there are of the quaver binds—of the semiquaver three sizes are cast, *viz.*, $1\frac{1}{2}$ -em, 2-em, $2\frac{1}{2}$ -em; if any others are required they must be made by joining two or more together; and of the demisemiquaver there is but the one size cast, which is shown—2 ems in width.

Grace notes are generally made a line shorter than others in the stems.

The other characters sent in a fount, such as rests, dots, slurs, marks of expression, etc., are placed as required. They do not need any explanation.

Subject to these peculiarities, music composition is a kind of mosaic work, which will tax the ingenuity and patience of the workman, but which requires no further elucidation.

Along with the manuscript, the compositor should be supplied with instructions as to the dimensions of the page required, and the size of the type to be employed.

Begin by counting the number of measures in the piece, and apportion to each measure the amount of ems in length of which the page will allow, so that there shall be a general equality of space throughout the piece.

In instrumental music, and in pieces which are not interlined with poetry, the compositor should set two or more staves simultaneously, ranging the leading notes in the under staves precisely under the corresponding ones in the upper staff; that is, a certain amount of space in each staff, in a brace, must contain the same quantity of time value.

Where lines of poetry are interspersed, as in church music and ballads, the staves are necessarily set singly, and in composing the second staff the workman must therefore constantly refer to the first, in order to make the staves correspond, proceeding in like manner with the third and fourth.





























A good compositor will be careful, whenever practicable, to make the lines overlap each other, brickwise, and not allow one joint to fall directly under another.

In some music founts the lines are cast double, to ex-

pedite composition. This really results in inferior work, although it is done more rapidly. The joints of the lines, coming under one another, are apparent in the entire depth of the staff. After a fount has been in use some time these joints (or rather openings) between each will become very visible—and unsightly. To remedy this, the stereotyper runs a brass rule along each stave line in the mould before it is thoroughly dry, thus closing up all the unsightly gaps between each rule, which are observable in a proof pulled from type that has been in wear some time.

The compositor should be careful to make the stems of all the notes in a page of the same length, except those of grace notes, which, as already stated, should be shorter than the stems of the other notes.

Gregorian or Chant Music.—The following is a synopsis of the characters employed in setting music in this notation:—

	Clef		Flat
	Bar		"
	Note Head		Natural
	" "		"
	" "		en rule
	" "		1-em rule
	" "		1½ "
	" "		2 "
	" Réclame		3 "
	" "		4 "
	Note and Stave Rules		"
	" "		Close
	Sharp on Stave		"
	Sharp off Stave		"

¹ This note-head differs in line from the first.

CHAPTER XLV.

COMPOSING MACHINES.—Requirements of a Satisfactory Machine
—Causes of Failure—Hattersley's Composing and Distributing
Machines—Kastenbein's, Fraser's, Hooker's, and Mackie's
Machines—the Thorne—the Empire—the Lanston Monotype
—the Linotype—Matrix Machines.

For nearly a century a large number of attempts have been made to supplant the compositor, or at least to supply him with a more or less automatic apparatus which will perform some or all of the mechanical parts of his duties.

The *object* of these machines may be regarded as three-fold :—

1. To lessen the cost of production of set-up matter.
2. To ensure greater rapidity in the execution of work.
3. (Incidentally) to render the employer less dependent on the employee.

The demand for type-setting machines arose soon after the introduction of printing machines. These have quite superseded the hand presses, but, with one exception—and this is not strictly a type-composing machine—the former have made hardly any appreciable difference in the demand for compositors. This has not been owing to any want of ingenuity, time, or money being spent upon the project ; for all three have been lavished with a liberality which finds, perhaps, no parallel in the history of mechanical problems.

The *requirements* of a completely satisfactory composing machine are, principally, the following :—

1. It must, when operated upon, be capable of rapid and correct composition and distribution.

2. The justifying of the line must be done with at least as much facility as in the ordinary composing-stick.
3. The mechanism ought to be simple, and not readily liable to get out of order.
4. It should work with as little noise or clatter as possible.
5. It should be capable of setting several sizes of type, and of manipulating every sort from an *m* to an *i*.
6. It should not require specially made type.
7. It should not break or unduly wear the type.
8. It should be capable of working by treadle or power, if the principle of gravitation is not employed.
9. It should require but little supervision.

Causes of Failure.—The principal reasons why type-setting machines have not come more generally into use may be thus stated:—

1. The expensiveness of such machines.
2. The almost complete failure of past inventions to cope with the various intricate operations of the compositor's work.
3. Inability to produce results with a speed sufficient to compensate for the cost and maintenance of machines as compared with compositors' wages for the amount of work produced.
4. The occasional untrustworthiness of the machines; it has not been safe in many cases to depend on them to produce the work by a stipulated time.
5. Proofs of matter set up by them are not always as clean as those from hand-set types.
6. The average compositor cannot decipher the manuscript and work the keys for any length of time at the speeds claimed by inventors.

The objections to the construction or working of particular machines are too many to be enumerated unless a detailed

description were given of each. They are generally objected to on one or more of the following grounds :—

1. That they are liable to get out of order. The types sometimes twist in the channels, or a letter or space catches in the mechanism and stops the machine.
2. That they are not adapted for more than one, two, or three sizes of type.
3. That they require specially nicked type, which is difficult to procure or expensive to prepare ; and that such type is always weaker than ordinary type.
4. That they injure the letters, sometimes breaking them altogether.
5. That some composing machines are not provided with a distributing apparatus, and the trouble of placing the types in the grooves right side up and the nicks one way ready for the composer neutralises the economy of the other part of the machine.
6. That the justification of the lines involves waste of time.

It would be impossible in this work to describe all the machines and devices, many of them most ingenious, which have been brought out with a view to supersede hand composition. With the exception of the Linotype, which is largely used in the production of newspapers, but which, as stated in the chapter on “News Work,” is not a *type*-composing machine, but rather a matrix-composing machine, not one of them has to any appreciable extent succeeded in doing so, though here and there type-setting machines are to be found, and it is desirable that the printer should have a general notion of their natures. The best way of dealing with the subject at the present time seems to be to enumerate those machines which have been most before the trade and to give a brief description of each. Such machines are

Hattersley's, Kastenbein's, Fraser's, Mackie's, Hooker's, the Thorne, the Empire, and the Lanston Monotype.¹ Of them, those which have been longest before the trade are Hattersley's machines, which were first patented in 1857 by the late Mr. Robert Hattersley, of Manchester, and have been greatly modified from time to time since. As these machines have had much the largest sale of any in this country and its colonies, and are therefore more likely to be met with than others, we give a more detailed description of them than of the others.

Hattersley's Composing Machine.—The type used is in every respect the same as that used in hand composition. It is separated according to the different sorts, is set up in lines, each type standing on its feet and with the nicks all one way, and is contained in the upper part of an iron framework about 3 feet square and 5 feet high. In the lower part of this framework is the keyboard. The two form the essential parts of the machine. All the mechanism is exposed to the eye of the operator, and there is direct access to every part—two considerable advantages.

The Keyboard.—The compositor works seated. He has before him the keyboard, consisting of a parallelogram, containing the keys in six rows, so arranged that the fingers and not the arm alone are required to operate it. Each key bears on it the character or sort which it will bring forward. The arrangement of the keys is the result of much study and experience. Attached is a set of space bowls, for spacing out.

¹ For descriptions of these machines, most of them illustrated, and several with diagrams, see the following numbers of the *Printers' Register*: Hattersley's, August; Kastenbein's, September; Mackie's, October; Hooker's (electric), November, 1877; Fraser's, January, 1878, and February, 1898; Thorne, April, 1890; Hattersley's again, August, 1890; Empire, August, 1894; Lanston Monotype, July, 1897; Cox, July, 1898.

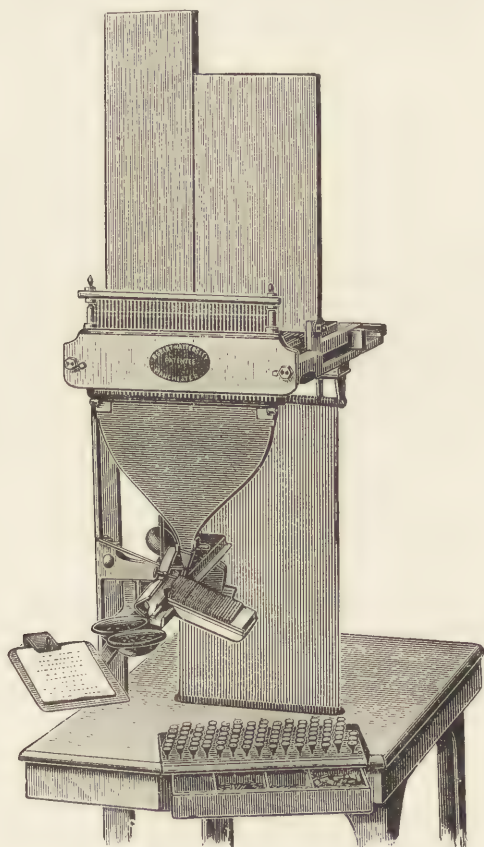
The Type Receptacles.—The type is stored upon two iron galleys, one of which contains the letters in more frequent use, the other those less frequently required. The type is ranged in rows separated from one another by brass partitions. To keep the type up to the front edge of the upper table, each row of types has a square of metal behind it, to which a steel spiral spring is attached by a band. This band runs horizontally over a portion of the type, and is then brought into the tall frame at the top of the machine, where it is fastened. Its elastic force, decreasing as the type row gets shorter, always keeps the letter to the front.

Transmission of the Types.—At the front of the galley or type receptacle at a point corresponding to the end of each respective row of type, a small opening is pierced, just sufficient to allow a type to fall through. The type standing over the opening in each row is, however, prevented from falling through by the pressure of the spring, operating at the other end of the row. When the passage of the letter is desired, it is effected by the operation of the key belonging to it, which brings down upon it a steel presser, corresponding somewhat in body and thickness. A gentle pressure from this overcomes the resistance of the steel spring, and pushes the letter through the opening below into its appropriate private channel in the V-shaped conducting plate. The presser is brought back by steel springs, which are made fast in the short front frame shown at the top of the cut.

Reception and Arrangement of the Type.—When the type has passed out of the exit channel it is received by the end of the horizontal lever immediately under it. This corresponds with the thumb of the compositor's left hand when engaged in setting a line in the ordinary way. A movement sends the letter forward by just its own breadth, so that room is then made for the next coming letter.

When the compositor has his line ready set and spaced,

he takes out the setting-rule, and drives the line down the galley by a motion of the parallel frame opposite. The setting galley can be made up to any measure by the



HATTERSLEY COMPOSING MACHINE.

adjustment of a slide-piece as in the ordinary composing-stick. If the matter is to be leaded, the leads are put in by the compositor as he proceeds.

Justifying.—When the line is all but set out, room being left for about a two-em quad more, a hammer falls upon a check bell, and gives notice of the completion of the line. The compositor now finishes the word or syllable, pushes the line into the composing galley for spacing out, and then, as already stated, presses the line, when justified, further down the galley.

Change of Type or Measure.—The machines when first invented were adapted only for working one size of type, and the arrangements for altering the measure of the matter set were slow and cumbrous. Recently a new system of duplex and triplex working has been instituted, the machines setting two and three sizes of type respectively, a complete change from one size to another being effected in half a minute. In altering the measure no adjustment has to be made by the compositor, but solid standard blocks are placed in the composing-stick to reduce the measure to the size required.

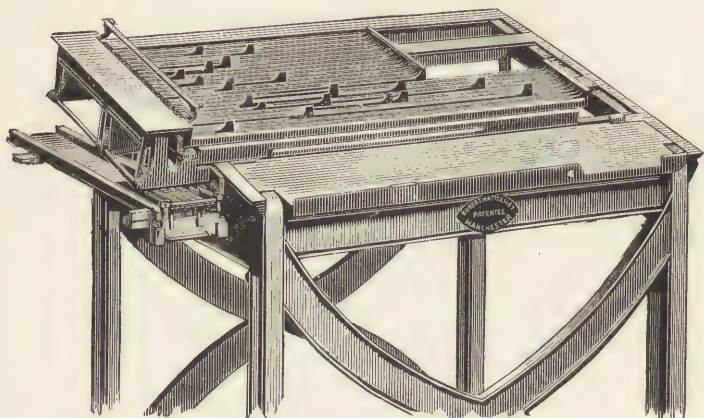
Speed.—It is claimed that a moderately active man, working from good manuscript, will set and space out from 7,000 to 8,000 letters an hour.

Hattersley's Distributing Machine.—The object of this machine is, of course, to take the page or column line by line and word by word, to decompose it into its elements, and then to recompose the rows of letters, in order to supply the composing machine with type. The mechanism is, in its general principle, in correspondence with the other apparatus. It stands on a table, and is about 2 feet 6 inches wide by the same depth, and one foot in height.

The two iron galleys for holding the supply or rows of letter in the composing machine can be unscrewed and fixed in position in the distributing machine for recharging. Here they are arranged crosswise to facilitate the movement of the workman's hand, by reducing the space over which it has to travel. On the frame of the distributing machine, where the heads of the trays fit in, is placed for each a

small apparatus with the view of enabling the letters to pass upright and without twist, through vertical grooves, into the rows assigned in these trays to each letter respectively.

The Distributor.—This is a small apparatus carried in the hand of the operator. A nickel case, just large enough to be grasped by the half-shut hand, the index finger being stretched out, surrounds the mechanism. In front is the line of type, the face of which lies so that it can be easily read by the operator. Under the first letter of the line, in the bottom part of the distributor, is a slide which can be



HATTERSLEY DISTRIBUTING TABLE.

opened so as to leave the letter above it with nothing to rest upon. The type is held in its place only by a light pressure on its sides, and a very small stroke on its top causes it to fall through the opening beneath it. This little stroke is given by a small steel rod placed above the letter, and motion is communicated to it by a system of levers. When moved outwards it exactly meets the face of the letter. The types are brought forward in the line by a short elastic band—a system similar to that employed to keep the letter in place in the supply trays.

In front of the hand of the operator are the supply trays. Over the latter is a metal plate, which serves as a table to the distributor. On the front end of this table is screwed a row of teeth, made in the metal plate. Outside these teeth are grooves for guiding each letter as it falls into the respective row to which it belongs. Close by the distributor is an index to facilitate the finding of any particular letter.

Operation of Distributing.—The work of distributing is usually performed by a boy or a girl. Taking the distributing stick in the right hand, the operative reads off a few words, lays it down on the plate, and gives a rapid push forward in as straight a line as possible, so that the pointer covers the particular letter which has to be distributed. At this movement the slide of the distributing stick, which is provided with a little knob for the purpose, has been caught by one of the teeth and the slide has been opened. In the same movement the "stick" reaches its destination and the "director" is caught between two of the teeth, and the levers are set in motion, which give the downward stroke to the first letter in the line. This falls through the groove into the corresponding row in the supply galley, where it takes its place in a standing position, and is pushed forward by just its own breadth, so that room is made for every letter before it comes. The comb-like apparatus, the steel teeth of which serve to push back the slide, is fitted with teeth, the length of which is proportioned to the breadth of each letter respectively. The tooth, for example, which opens the slide to admit an *m* or an *n* is as much longer than that of the *i*, as *m* or *n* is thicker than *i*.

The spaces having been put in in the justification, and being unnecessary in the rows of either the composing or the distributing machine, fall out in distribution into a box placed below the machine, whence they are taken to be used over again.

The matter for distribution stands on an iron galley, and is kept pressed to the head by a weight attached to a cord passing over a pulley. The distributor receives a line of distribution from a galley by means of a hinge-flap placed under the line.

The distributing apparatus is now adapted to work with the duplex and triplex arrangements of the composing machine. A simple method of adjusting the distributing galleys to receive the different widths of matter for insertion has also been invented. This consists of two bridge-bars placed over the galley and over the sidestick. The bridge-bars are correctly drilled to ens, and when adjustments are to be made the bar is simply moved forward opposite the hole stamped with the measure required, and a plug is pushed through the bridge-bar into a corresponding hole. This keeps the sidestick rigidly in position at exactly the measure required.

Speed.—Distribution is rather slower than composition. If, however, the time consumed in justifying and correction be taken into account, the distributing machine will be found to be able to keep up with the composing machine, one operator at each.

Price.—The price of Hattersley's composing machine is £190; that of the distributor, £100; making, for a set of the complete apparatus, £290.

Economy Claimed.—According to the inventor, with two operators—a boy or girl at the distributing, and a man at the composing machine—6000 per hour can be set, justified, and distributed. "Suppose the compositor is paid 55s. per week, and the distributing boy 13s. 6d. a week; and that the working time is nine hours a day. With these, 6000 per hour will be comfortably set and distributed; and, assuming the operators to work at this rate continuously, they will get through 324,000 in a week, at a cost for wages of £3 8s. 6d. If the production is 324,000 per week, this will

be at the rate of $2\frac{1}{2}$ d. per 1000. As the types are scarcely handled at all, it does not matter to the operators whether they are working on pica or nonpareil. The London scale from English to brevier is $7\frac{1}{2}$ d. per 1000, minion $7\frac{3}{4}$ d., and nonpareil $8\frac{1}{2}$ d. Striking an average, and allowing for the work of making up, imposing, etc., which is included in those prices, we may say that the actual processes of composition and distribution at piece prices cost 6d. per 1000. Therefore, to set 324,000 by hand would cost £8 4s. The difference between this sum and £3 8s. 6d. gives the saving in wages by using the machines, *viz.*, £4 15s. 6d. per week: equal to £248 6s. in the course of a year; rather less than the cost of the machines." It is right to add that we have not had an opportunity of practically verifying these figures. The machines are made on the interchangeable system, so that parts can be readily exchanged. The annual expense of maintenance is said not to exceed 1 per cent. of the cost of the machine.

The Kastenbein Machines.—These were invented by Mr. Charles Kastenbein, of Brussels. They were brought out several years after Mr. Hattersley's, and the composing machine resembles his in several important features. It, too, has a V-shaped conducting plate with grooves in it, and the work is done by operating on keys. The type to be set is stored in vertical metal tubes placed on end at the top of the conducting plate, each over its particular channel. On a key being depressed, a metal pusher pushes a type out of the tube, and by a simple and ingenious arrangement causes it to fall down the groove of the conducting plate foot first; a reciprocating rod operating near the mouth of the exit channel passes it on so as to make way for the next type. All its parts are metal, there being no elastics as in Hattersley's. It is, however, not so easy to the touch as the latter machine. The distributing machine is in many respects like a composing machine turned upside down, the type

being conveyed from the apex of the conducting plate by means of grooves and switches to its proper tube.

These machines were adopted at the *Times* office, and were somewhat improved by the engineers there. We are not aware that they are now to be found in any other English printing office.

Fraser's Machines are very like Kastenbein's in appearance and principle, the difference being chiefly in points of mechanical detail. They have been successfully worked for many years at the office of Messrs. Neill & Co, Edinburgh, where they have been used for setting up a large part of the ninth edition of the *Encyclopædia Britannica* and other important works, but they are not used outside that office. The price of the composing machine is £100.

Hooker's Composing Machine was the invention of a compositor at Messrs. Clowes & Sons', who used it for some years. In it the types were stored in assorted piles, and as each was wanted a pusher pushed it from the bottom of its pile on to a travelling tape communicating with another travelling tape, which delivered it to the setting-stick. The pushers were worked by electricity, contact being made by a metal stylus attached to a wire, the stylus being held in the hand of the operator, who with it tapped a little metal model of a lower case, the letter required being released at each tap. The tapes were variously speeded, so that the types should always be delivered in their proper order to the setting-stick. Type could be set at a great rate with this machine when all was in order, but it was not always to be relied on, and it made no headway, though the system of the inventor was one which will probably be developed some day with success.

Mackie's Composing Machine was the invention of Mr. Alex. Mackie, proprietor of the *Warrington Guardian* and other newspapers. It was circular in motion and, worked

by power, set up type in a long line automatically, the machine being guided by a paper ribbon or tape punched with holes corresponding with feelers appropriate to the several characters, the operation being similar to that of the Jacquard loom. The holes were punched in the tape by operating on the keyboard of a perforating machine, which was quite distinct from the setting machine. Mackie's system was very ingenious, and was worked with some economy in his own offices, but nowhere else.

The Thorne Machine.—In this, an American invention, the most prominent features were two vertical cylinders of equal diameter, whose circumferences were composed of some ninety vertical grooves for the reception of types. The top cylinder revolved on its axis, while the lower was fixed. The top cylinder was for receiving types for distribution, and dropping them into the lower, which acted as a receptacle for types to be composed. Both composition and distribution were thus performed by the same apparatus, and this either independently or simultaneously as desired. The types used in the machine were all specially nicked, each character having a nick or combination of nicks appropriate to itself. These were the means whereby the machine automatically selected from a line of composed matter all types of the same denomination, collected them, and passed them into their proper groove. Composition was done by pressing keys, each key communicating, by means of levers and rods, with the lower mouth of the groove appropriate to it. Under the lower of the two cylinders was a revolving plate kept in constant motion by motive power, and when a key was depressed a type was ejected from the appropriate groove on to this table, which conveyed it to a travelling band, whence it passed to the receptacle which served in the place of a composing-stick. Here type after type was gathered up with great rapidity and passed on into a long line, which was divided and taken away from time to time

by the operative employed in justifying. The keys might be struck separately or in combinations—thus the word “the” might be composed at the same moment by striking three keys as a chord. Three persons were required to operate each machine: One at the keyboard; a second to break up and justify the lines and correct errors; and a third, a boy, to keep the distributing cylinder fed, and to supervise the machine generally. The rotary motion required was obtained from steam power. The machine was used in the *Manchester Guardian*, the *Sportsman*, and other offices. It is used in many offices in the United States, but has not been heard of in England for some years.

The machines which at the present time make serious bids for favour in opposition to the Hattersley and the Linotype are the two which follow. It remains to be seen whether they will be more fortunate than their numerous and ingenious predecessors. They are both of American origin, and have been before the British public for six years and three years respectively.

The Empire.—This composing machine is another with the V-shaped conducting plate, after the style of Hattersley's. The types are placed in eighty-four channels at the top of the machine. They lie in piles on their sides, the face of the type fronting the operator through a glass which encloses the channels on that side. When a key is pressed the type drops down the V-shaped plate foot foremost into a race or channel, where, by the operation of a pendulum gate, they are passed on in a continuous line towards the operative who justifies them. This operative holds in his left hand an instrument called a “grab,” adjusted to the required measure, and with it he draws from the race sufficient types to form a line, and puts them in the “composing-stick,” where he justifies the line. Spaces and quads are placed handy for him in channels.

The distributor works automatically, the types being nicked at the back. A page of type is placed upon the galley at the top of the machine, and kept continually pressed towards the required place by a weighted follower. Under the first line of the page an elevator plate rises and falls. On this plate one line at a time is lifted into a channel, along which it is pressed into the machine by another weighted follower at right angles to the first. One type at a time is pushed off from the end of the line by a spring-actuated driver vibrating at right angles to the line, and made to remove the first type only, whatever its thickness. As each type is pushed off it is received by one of a series of travelling carriers, and there its nicked edge is felt by feelers or nick pins, of which there are as many as there are different characters, and only those which correspond to the nicks on the type act on it, the others passing by; the acting feelers carry the type along into a race or slide which leads to a tube appropriate to the type, and into which it falls ready for use in the composing machine. When the last type on the elevated plate is disposed of, the plate automatically sinks, the page is forced over it, and rises with another line. Each machine will set and distribute two bodies—*e.g.*, small pica and long primer.

At the time of going to press a new self-justifier for the Empire is on the eve of being made public.

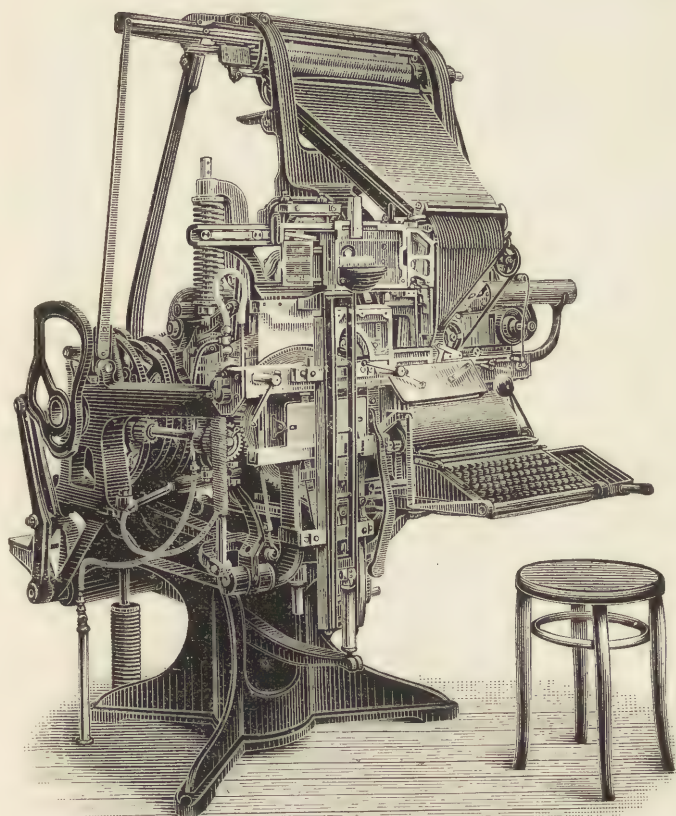
All the machines already passed under notice have been automatic composing machines pure and simple, using the same kind of type as is used for hand composition, the proofs being readily corrected at case by compositors while the machines continue the composition, this being the one great advantage over line or slug casting machines. In the next invention not only is the same type used, but it is cast as the composition of the line goes forward, and may be corrected at case when the proof is read.

The Lanston Monotype.—This invention consists of two

parts—*viz.*, a type-caster in which single letters and spaces are cast as required to make up the words and intervals forming lines, and a ribbon perforator which produces the “card” or perforated ribbon that, on the principle of the Jacquard loom, “teaches” the type-casting machine what letters and spaces it must cast. The “copy” to be set is handed to the operator at the perforating machine, and he or she (for it is work which can easily be done by a woman) by depressing appropriate keys punches in a long ribbon of paper the combinations of holes appropriate to the types required. Spacing and justification of lines is provided for by an ingenious system, which we cannot here describe. On the ribbon being transferred to the type-caster, the mechanism so operates in conjunction with it that one after another the requisite matrices are advanced to position and the moulds adjusted, so that every half second a type is ejected on to a galley, and the types follow one another in the order required, so that perfect lines are set up from fresh cast types to the exact measure required. The types being of the ordinary movable kind, alterations can be effected in the matter as readily as if it were set by hand.

In this system the type when printed from is thrown into the melting pot and recast, or it can be distributed into cases to be reset by hand.

The Linotype Composing Machine is not a type-setting machine in the ordinary sense of the word, but is a machine which, being operated by finger-keys, like a typewriter, creates, or produces, type matter; that is to say, it produces and assembles, side by side, metal bars or slugs (Fig. 1), each of the length and width of a line of type, and having on the upper edge the type characters to print an entire line. These bars, having the appearance of solid lines of type, and answering the same purpose, are called “linotypes.” When assembled side by side on a galley, they are ready for making up into a forme, presenting the



THE LINOTYPE MACHINE.



FIG. 1.

same appearance as if composed of ordinary type, and adapted for use in the same manner. After being used, the linotypes are simply returned to the melting-pot to be recast into other lines, thus doing away entirely with the cost and labour of distribution.

The Linotype machine contains, as its leading members, a large number of small brass matrices, such as shown in Fig. 2, consisting each of a flat plate, having on its vertical edge a female letter or matrix proper,

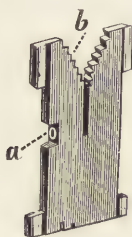


FIG. 2.

vertical edge a female letter or matrix proper, *a*, and in the upper end a series of teeth, *b*, used for selecting and distributing the matrices to their proper places in the magazine. A machine "fount" includes a number of matrices for each letter, or character, represented on the keyboard. The magazine in which the matrices are held when on the machine contains a series of grooves, down which the matrices slide, and from the lower ends of which they drop one by one when released by the operation of the keyboard.

The machine is organised to select matrices bearing the required characters, and set them up in line side by side with intervening spaces, in the order in which they are to appear in print, as shown in Fig. 3, and thereafter to present the line to a mould so that the linotype or slug may be cast against and into the entire line of matrices and spaces at one operation.

These operations are effected by a mechanism such as is shown in Fig. 4, which represents in outline the principal parts of the machine. A is an inclined stationary magazine or holder, containing channels in which the assorted matrices are stored. The matrices tend to slide downward out of the magazine by reason of their gravity, but they are held in check by escapements B, one at the mouth of each channel. From these escapements, rods C are extended

downwards to a series of finger-keys D. There is a special key for each character or letter. The keys are depressed by the operator in the order in which the corresponding characters are to appear in print. Each time a key is actuated it permits a single matrix, bearing the corresponding character, to fall out of the mouth of the magazine and downward through the channels E, to an inclined travelling belt F, by which the matrices are carried downward one

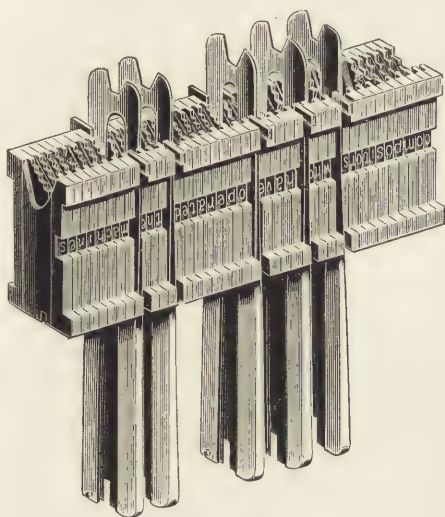


FIG. 3.

after another and delivered into the slotted assembling block G, in which they are set up, or composed, side by side in a line, or row, as represented in Fig. 3. A stationary box H contains a series of space-bands I, and a delivery device is connected with finger-key J, by which the spaces are discharged and permitted to fall into the line at their proper places. Thus it is that, by operating the keys, the required matrices and spaces are delivered one after another and

assembled in line in the block G, until it contains all the characters necessary to complete one line of print. After the line of matrices is thus composed it is transferred, as shown by the arrows in Fig. 4, to the face of a vertical

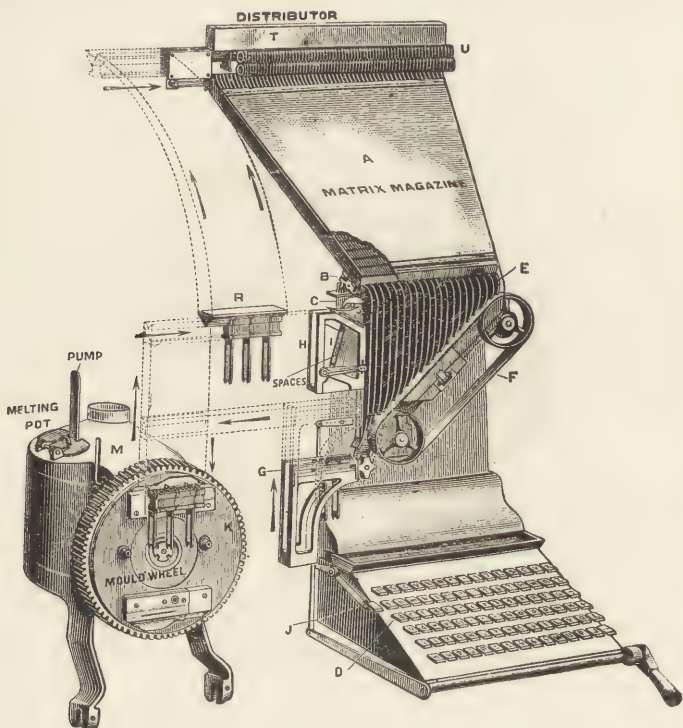


FIG. 4.

mould wheel K, through which a slot or mould proper extends from the front to the rear face.

Behind the mould wheel there is arranged a pot, in which type-metal is maintained in a molten condition by a flame from a gas-burner under it. The pot has a delivery mouth,

or channel, adapted to fit against and close to the rear face of the mould. Within the pot there is mounted a mechanically operated pump-plunger. After the line of matrices is presented and locked against and across the face of the mould, the mouth of the pot is closed against the rear side of the mould, and the plunger then operates to force the molten metal from the mouth of the pot into the mould, in which it solidifies, completing the slug or linotype.

While the line of matrices and space-bands is in front of the mould, the wedge-shaped space-bands (shown in Fig. 3) are forced upwards, and in this manner exact and instantaneous justification is secured.

The entire row of characters in the matrix line is thus presented directly opposite the face of the mould or slot, and when the mould is filled with metal to produce a slug or linotype, the metal will flow into the matrices, which produce their respective type characters in relief on the edge of the casting.

After the linotype is thus produced, the mould wheel makes a partial revolution, turning the mould slot from the horizontal position in which it stood during the casting operation, to a vertical position.

While the mould stands in this position, a horizontal pusher having a blade attached advances from the rear and pushes the linotype forward out of the mould and between the trimming knives, which trim them at both sides and at the foot, thus rendering them exactly type high, into the galley on the front of the machine. A vibrating arm advances the linotypes one after another into the galley, in which they are thus assembled side by side in column form.

After the assembled matrices have answered their purpose in front of the mould, it is necessary to distribute and return them to the magazine, from which they are again in due time discharged for use in succeeding lines. The line of matrices is first lifted vertically, as indicated by dotted lines

in Fig. 4, and then laterally until the teeth of the matrices engage the ribs of the bar R. This bar then rises, as indicated by dotted lines, lifting the entire line of matrices to the distributing mechanism at the top of the magazine. The space-bands remain behind when the matrices are lifted to the distributor, and are transferred laterally to the box or holder H, to be used again.

The distribution of the matrices to their proper channels is effected as follows: Each matrix (Fig. 2) has the teeth, *b*, in its upper end arranged in a peculiar order, or number, according to the letter which it bears. In other words, a matrix bearing any given letter differs, as to the number or arrangement of its teeth, from a matrix bearing any other letter, and these teeth are relied upon as the means for effecting the distribution. As shown in Figs. 4 and 5, a rigid steel bar T is fixed in position above the open upper ends of the magazine channels, and is formed at its lower edge with longitudinal ribs, adapted to engage the teeth of the matrices and hold the latter in suspension. The ribs of the distributor-bar vary in number and arrangement at different points in its length, in correspondence with the varying teeth of the different matrices. There is a special arrangement over the mouth of each channel of the magazine, which assists the disengagement of the matrices, and guides them into their proper channels.

The matrices to be distributed are simply pushed horizontally upon the bar at one end, so as to hang suspended therefrom, and then moved slowly along it over the mouths of the channels. Each matrix will remain in engagement with and be suspended from the bar until it arrives over its proper channel, where the arrangement of teeth, agreeing with the openings cut in that particular spot in the steel bar, permits the matrix to disengage so that it falls directly into its own channel. This falling action of certain matrices into their respective channels, while other matrices are con-

tinuing their course along the bar to their proper points of delivery, is clearly shown in Fig. 5. The movement of the matrices is effected by means of longitudinal screws U (Fig. 4), which lie below the distributor bar in position to engage the edges of the matrices and slide them along the bar.

It will be observed that the matrices pursue a circulatory course through the machine, starting from the mouth of the magazine, and passing downward to the line in which they are assembled; thence to the mould, to produce the letters

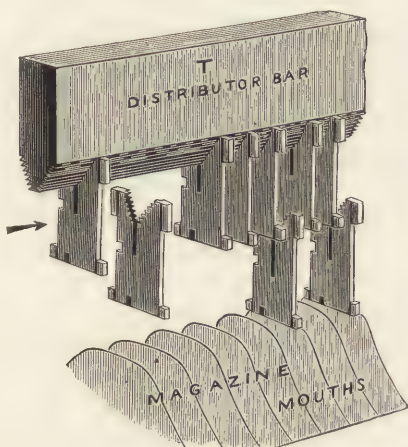


FIG. 5.

on the linotype, and finally back to the distributor-bar, from which they fall into their proper grooves in the magazine as previously described.

It is this circulation of the matrices, and the fact that the operations of composing one line, casting from another, and distributing a third, are carried on concurrently, and without interference, that enables the machine to operate at the amazing speed of from eight thousand to sixteen thousand ens per hour,

As may be gathered from what has already been stated, the Linotype has done more to displace hand composition than all the composing machines yet invented, and it is very largely used for the composing of newspapers. It can be employed for bookwork, and occasionally is so used, but books printed from its slugs have often a poor appearance, and it is not adapted for best work.

We do not append any directions for working the machine or keeping it in order, for we conceive our duty to consist in instructing the compositor to use movable types, and the Linotype dispenses with these; moreover, the Linotype Company have themselves issued a complete book of instructions for using the machine, which they supply gratuitously to all interested in it.

Matrix Machines.—Apart from the Linotype, there have been many ingenious inventions whose object has been to dispense altogether with types. Most of these have consisted of machines in which keys operate punches, which strike *papier mâché* or some other substance and make depressions therein. Words are formed by striking key after key, and thus lines are formed, the *papier mâché* being moved up after each line to receive another. When the matrix of a page or column has thus been formed it is removed to a casting box, and a stereo plate is cast from it. The obvious drawbacks to these machines are that lines cannot be evenly justified, and that corrections are extremely difficult to make: they are, in fact, impracticable except in the hands of men who make no mistakes—and where are such men to be found?

The Economy of Composing Machines.—In calculating the saving in cost of production of these machines over that of hand composition, there are numerous items that should be taken into consideration:—

1. The initial cost of machine.
2. Cost of maintenance (power, gas, materials used, etc.),

3. Number of workmen immediately engaged on each, either as operators or engineers.
4. Extra cost of corrections both by operators and by readers.
5. Loss through breakdowns.
6. Loss through machines standing idle, waiting for copy.
7. Deductions for wear and tear.
8. Percentage on capital invested or on royalties paid.

Considering the cost of machine composition per thousand ens is about half that of hand composition, the quantity of output must necessarily be far greater in order to produce a balance on the right side. Hence operators on the Linotype, for instance, are expected to produce not less than 6,000 ens per hour.

CHAPTER XLVI.

PROOFS.—Different kinds of—the Reader—His Qualifications and Duties—Compositors' Duties in Correcting—System where the work is done by Piece Hands—Technical Terms—Keeping Accounts of the Stages.

Proofs.—A proof, as we saw on page 213, is an impression of type-matter taken for the purpose of ascertaining if that matter be correct, and for aid in correcting it.

As proofs are often required at different stages of the work, there are three different kinds, *viz.*: (1) Proofs in slips, or slip-proofs; (2) proofs in pages; (3) proofs in sheets, the last-mentioned being subdivided into first proofs (in sheets) and press revises, *i.e.*, revises of the sheet just prior to working off.

A *slip-proof* is an impression of matter contained in a slip galley. The galley is locked up by having a sidestick and quoins inserted, and it is then taken to an ordinary Albion or Columbian press or to a galley press; the type is there inked with a hand roller, a sheet of paper is laid on it, and then the impression is taken in the usual way.

Proofs in pages are proofs of the matter after it has been made up into pages, and before it has been imposed. The pages are sometimes contained, either separately or two or three together, in slip galleys.

Proofs in sheets are proofs of imposed formes; they are taken to show how the matter will look when the forme is worked off.

Readers.—Proofs are examined by men called “readers” or “correctors of the press.” Their duties are to find out
(538)

all errors, mark them on the proofs, and then see that the necessary corrections are made. A proof of matter before it is submitted to the reader is said to be "rough;" after it has passed through his hands it is said to be "read." The rectification of the errors and imperfections by the compositor is called "correcting." A proof that contains many errors is said to be a "foul" or "dirty" proof; one with very few or no errors is said to be "clean."

A reader ought to be a practical printer, and should thoroughly understand the technicalities of his profession. He ought also to have a good general education. A knowledge of languages, especially French and Latin, will prove valuable to him, and he should also possess some knowledge of literature and good general information. In addition, he must be very patient, keen to discern anything wrong, and accurate and methodical in correcting it. He must, of course, have a thorough knowledge of the signs and marks given on pages 216 to 220.

Each reader has a little room or "closet" to himself, or rather he shares it with a boy called a "reading boy" or "copy-holder." The lad's duties are to read the "copy" (manuscript or print) aloud to the reader, while the latter follows, pen in hand, with the proof before him.

The reader's closet should be furnished with certain books of reference. A good English dictionary is indispensable, and other useful books are Latin, French, and German dictionaries; dictionaries of quotations, English, French, and classical; a classical dictionary, a biographical dictionary, Haydn's *Dictionary of Dates*, a gazetteer, an index to titled personages, and such books as *Hazell's Annual* and *Whitaker's Almanack*.

The reading boy should be fond of reading, and able to decipher manuscript easily. Should the MS. be rather illegible it may either be compared or the boy may read from the proof. In the latter alternative (which should

only be adopted in exceptional instances) the proof must afterwards be read through by the reader in order to discover what further correction may be necessary.

Slip-proof Reading.—In this the reader has to see that all the copy has been set, that the words are properly spelt, that there are no wrong types or up-standing spaces, that the matter is properly broken up into paragraphs, that the spacing is even, and that the “style of the house” or the “style of the author” has been followed.

There should always be a complete understanding between the composing room and the reading closet as to style, whether it be the style of the house or of the author, otherwise much time will be lost in correcting the proof.

In reading a proof, it is a good plan to imagine a line drawn vertically down the middle of the slip or page. Corrections to be made on the left of this line should be marked in the left-hand margin, and the others in the right-hand margin.

Whenever the copy contains matter in a foreign language, or is otherwise unusually difficult, the reader should compare it word for word with the proof.

In reading a proof most errors are obvious, but it requires much attention and a practised eye to detect some, such, for instance, as the following :—

- o (sm. cap.) for o (lower case).
- o (turned) for o (right way up).
- s (turned) for s (right way up).
- s (sm. cap.) for s (lower case).
- q (b turned) for q.
- p (d turned) for p.
- n (u turned) for n.
- b (q turned) for b.
- d (p turned) for d.
- u (n turned) for u.
- 6 (9 turned) for 6.
- 9 (6 turned) for 9.

Care must also be taken to see that the double letters ff, fi, fl, ffi, ffi are used instead of the separate letters (unless, of course, the fount is cast without them), and in old style work that the other ligatures are properly used.

Where a proof contains matter set by several compositors, the reader writes at the commencement of each "take" the name of the compositor who set it. This he finds on the copy, for we have already seen that it is the duty of every compositor to write his name on the copy he sets from. The reason for this will appear shortly.

Proofs in Sheets.—*First Proofs.* The reader must first see that the sheet bears its proper signature, and then that each page is of the proper size, and has its proper folio and head-line. He must then see that the connection between it and the sheet immediately preceding it is correct. The reader will then go through it to discover if the copy has been correctly followed, and to make necessary corrections.

The sheets or slips which go out to the author are usually accompanied by the copy relating to them. Should there be any more of the work to follow, the reader will not send out the page of copy containing the last word of the last sheet sent, but will retain it to be sure that a proper connection is made. He will mark on it with a bracket, in ink or blue pencil, the place where the sheet or slip ends, and in the margin will write the folio and signature of the sheet or the number of the slip which is to follow. This side of copy is called a "prima," and is always referred to by the reader when the next portion comes in to be read.

Press Proofs.—There is in some offices a press reader, specially selected because of his fitness and experience, whose duty it is to finally read and pass the sheets for press. His paramount aim must of course be the accuracy of the text, both as to its matter and its manner, as well as such technical details as seeing that the connection

between each sheet is right; that the signatures are right; that the headings are proper, duly centred and in the correct style throughout; that the style of the house or of the author, as the case may be, is consistently followed; that the paragraphs are properly and uniformly indented; that the illustrations, if there be any, are in due order and properly identified in a uniform style; that the references to notes occur at the proper places, and in due sequence; and that the notes themselves are in due order.

The usual course with regard to proofs is now as follows :—

1. Matter in galleys or imposed in slip (first slip-proofs) pulled and sent with copy to reader.
2. Proofs read and returned to composing room. Copy retained by reader.
3. Corrections made by compositors.
4. Another proof of the matter so corrected is now pulled (this second proof is called a *revise*) and sent to the reader along with the first proof he marked.
5. The reader, by comparing the first proof with the second, sees that the corrections have been duly made. This is called “taking off the marks. If there are still many corrections to be made, the reader marks them on the margins of the revise, and may write on the top: “Pull another revise.” The first revise has then to be corrected by the compositor, and a second revise pulled and submitted to the reader.
6. This second revise being found right, or having only a few corrections, the reader writes on the top the number of proofs required and sends it back to the compositor (or clicker). In due course the reader receives the “cleans,” as the new proofs are called, from the proof-puller, and

having again revised the marks—making any further corrections on the margin that may be necessary, and calling the author's attention to anything he considers doubtful—he passes on the proofs and the copy to the overseer, who addresses them to the author. The author then makes such alterations as he thinks fit and returns his proof to the printer.

7. The "author's corrections" are now made by the compositor, after which a fresh slip-proof is pulled and submitted, with the author's proof, to the reader, who sees that the corrections have been properly made, or makes marks accordingly, and returns the proof to the overseer after heading it "R. A. P." (revise of author's corrections).
8. The overseer now heads it, "Make up into pages," and these are accordingly duly made up, as shown in Chapter XXII.
9. The pages are duly imposed and locked up in formes.
10. Proofs in sheets are pulled and sent to the reader, who looks to the connection of the matter, the signatures, head lines, folios, margins, etc.
11. Duplicate proofs in sheets are sent to the author.
12. The reader's (and author's) proofs in sheet are returned to the composing room, the necessary corrections made, and the formes gauged ready for press.
13. A press revise (or "machine revise," as it is now sometimes called) is submitted to the press reviser.
14. Should he wish to see a second revise, he may write at top: "Show another." On the contrary, if he is quite satisfied, he will write the word

"Press," with the date, the order number, and the number of copies to be worked.

15. The sheet is worked off, and a copy of it is filed.

Some of these stages may be omitted ; it often happens that the author does not get his proof until the matter is in pages, and not unfrequently that he does not get it till the matter is imposed. We have already stated that it is more economical to let him have it earlier, for if he makes many corrections these may necessitate remaking up the forme. On the other hand, the number of stages is sometimes increased ; for not unfrequently the author requires two or even three proofs of the work at various stages to be submitted to him. If the forme is to be stereotyped, instead of one revise being pulled to be marked "Press," two are pulled—one is marked "Foundry" and is given to the stereotyper, the other is kept by the clicker or overseer.

Compositors' Duties.—The mode of correcting matter has already been stated (see pages 222 to 226).

When the work has been set up by different compositors, there are in London, and towns where London customs are followed, certain regulations concerning corrections. When a compositor is "on 'stab" (on the establishment), that is, when he receives weekly wages, or works "on time," the correcting is done as part of his time work. But when the compositor is "on piece," that is, when he is paid for his work one specified pre-arranged price, he corrects his errors at his own expense. Hence, if a man is on 'stab, it does not matter whether he is called upon to correct another's mistakes as well as his own ; but if he is on piece, he is amenable to the correction of his own matter only, and this correcting he does without further charge. These remarks apply to the first proof and its revise.

It frequently occurs that composed matter is made up into pages as soon as it is set, and before it is corrected ; time is then occupied not only in correcting, but in operations

preliminary to it, such as finding the forme, dropping it, and unlocking it. Hence, it has been arranged that the compositor who had the first "take" in the sheet "lays up" the forme on the imposing stone, as well as corrects his own matter. He then hands the proof to the compositor whose name is written next on the proof, who does the marks occasioned by his own errors. The proof is thus passed on till it reaches the compositor who has the *last* take in the sheet, and he locks up the forme, and either pulls it himself or sees that it is conveyed to the pressman or proof-puller.

If a compositor happens to have matter in the first and in the last part of a sheet, he is usually called upon only to lay up the forme and correct his matter. The compositor who is last but one has then to lock up the forme.

In some houses these rules are modified to remove hardships which might possibly arise were they carried out in their entirety. The compositor who has set up matter which does not exceed the first page has to lay up only one forme, and the next compositor lays up the next, when the work is imposed in sheets. So, if a man has the last take, and it does not exceed a page, he locks up one forme only, his immediate predecessor locking up the other.

Great responsibility attaches to each compositor at work on a forme composed by several different hands. Any one may do his work so badly or commit such an error as may entail labour and expense upon all concerned. To meet cases of this kind, a rule is enforced to the following effect : If a forme is broken, or if letters drop out, through carelessness in locking up, the person who locked up must repair the damage.

If, on the other hand, the damage is caused in the process of correction, the person who actually caused it is bound to repair it.

An "out" or a "double" in a take might cause the whole

of the matter in a sheet coming after it to be overrun. This should be done by the compositor committing the error; and he would have to correct any errors incidental to the overrunning caused by his fault.

The responsibility thrown upon each compositor of correcting his own matter is, in some houses, varied in certain cases where waste of time would be occasioned by its being rigidly carried out. It is agreed that if only a certain number of errors are present, the proof is not passed on. For instance, A is at work correcting his matter; when he has done, he would in the ordinary course pass on the proof to B, in order that he might do his marks. But if B has less than three marks, A does them for him; and if C follows and has only three, A does them as well, and those of all the other compositors whose errors are below a certain number. This number may be three, five, seven, etc., according to the custom of the house. Although this rule will work inequitably on occasions, it often prevents a man from being taken from a job he is engaged upon to do what will require only two or three minutes, these minutes sometimes involving the loss of perhaps an hour in changing work, blunders by being taken suddenly off a job, etc.

The person who locks up the forme has, of course, to satisfy himself that all the pages are of equal length. If, however, any imperfection in this respect is unobserved, the next to lock up has to make good any damage to which it leads. By some persons this is regarded as unjust. The man who makes up the pages has to see to the length of the pages, and after all the corrections are made, the man who corrects the press proof sees to the final gauging, lest any page may have been lengthened or shortened in overrunning. This is always done by a 'stab hand, and after he has finished, the forme or formes should be perfect in every detail.

Technical Terms.—The following technical terms, which belong to the process of correction, may here be explained :—

A.P.—Author's Proof.

R.—Revise.

Cancel.—Matter that is set up but not worked off, and therefore ordered to be distributed.

Clearing the Stone.—Removing, after imposition and correction, any letters, leads, furniture, etc., that may remain on it, and putting them in their proper places.

Double.—An unnecessary repetition of words; as, for instance, the word *the* set up twice where it should be once only.

H.O.—Hold over.

Literal.—A literal error, *i.e.*, an error consisting of a type being wrongly inserted.

Out.—An omission; a letter, word, or phrase accidentally omitted.

Prima.—The piece of copy containing the first words of a sheet or take. Also the galley containing the matter commencing the next sheet of the make-up, or the next page if the make-up has been stopped for some time. The maker-up sets a line at the top of this galley thus—"Prima. Boer War 127. Sig. F, page 65;" thus affording him full information when the make-up is gone on with next time. (The word is a Latin plural, but is used in a printing office as a singular noun.)

Query.—A question indicated on the margin of a proof, and written either with the letters *Qy.*, or the interrogation mark [?].

Quote.—A quotation, marked by turned commas at the beginning and apostrophes at the end; as, Does he say, "I will"?

Qy.—An abbreviation of *Query*.

R.A.P. or *R.A.* only.—Revise of Author's Proof.

Specimen.—A properly printed sheet given to the compositor as a sample, and an indication of the style he is to follow.

Turn.—A letter turned round, as *w*, or one placed in such a position that an impression is taken of its feet instead of its face. When matter runs upon sorts, and one character is exhausted before the case is empty, a type is used of the thickness of the one that is short, but turned round so that it may not be overlooked in the correction. Some turn it feet upwards, but this should on no account be done, as it destroys the delicate lines and serifs and batters the face.

It is very important that all the *press* proofs of a work should be kept in pigeon holes in the overseer's closet, or some other safe and accessible place. *Primas* are kept in a drawer or on a file.

On the following page is the heading of a book kept in some of the large offices, which indicates at a glance the progress of correction of any sheet:—

SHEET RECORD.

549

[illegible]

CHAPTER XLVII.

PAYMENT FOR COMPOSITION.—Casting Up—a News Hand's Bill—Apprentices' Pay.

WE have now completed the course of technical instruction for compositors. There remains but one subject on which to instruct the reader, and that is how to charge for his labour. If he be paid by time, or, in other words, be a member of the establishment ("on the 'stab," as it is called), he will get his fixed wages every Friday or Saturday, with any additional pay to which he may be entitled for overtime. If, however, he be "on piece," he is paid only for what he has set up, and this is measured by the thousand ens. He therefore requires to know the system of calculating the value of his work, which is called casting up.

Casting Up.—The rate of payment is, as we have said, per thousand ens—not ems, as in America. The plan for reckoning the number of ens is as follows: First set up a line of em quads to the measure of the stick, of the fount in which the matter is set. Count them and multiply by 2; this gives the number of ens in a line. Count the number of lines in the page; multiply this by the number of ens in each line. The result is the contents of that page in ens.

Example: How many ens are contained in a page 22 ems wide and 39 lines deep? The answer is 1716 ens; *i.e.*, $22 \times 2 \times 39$.

Compositors on piece are paid so much per thousand ens
(550)

according to the size of the type, small type being paid for at a higher rate than large. Therefore the number of ens, divided by 1000, is multiplied by the price per thousand, as 6d., 7d., 8d., and the result is the price of setting the matter composed.

In casting up sheets, or sections of sheets (which is always done by the clicker of the companionship where the work is done on the clicking system), the heads, whites, and signature lines are included; that is, exactly three extra lines are added to each page of text. If the measure is not an even number of ens in width, then if the excess is less than a thick space it is not reckoned; but if it be as much as a thick space, the excess is reckoned as an additional en in the width, and in like manner anything in the length exceeding an even number of ems is reckoned an additional em if it be as much as an en.

Suppose a printer wants to know what it will cost to set a sheet of 16 pages of long primer solid, the measure being 36 ems (long primer) wide, and the number of lines in the page (including whites) being 52. He multiplies 36 by 2, and then again by 52—this gives the number of ens in a page (3744); he multiplies this by 16 and gets the number of ens in the sheet (59,904). In casting up, according to the London scale, 500 ens and over count as 1000 ens, while less than 500 are dropped altogether. Therefore, in this case, 59,904 ens would count as 60,000, and if the rate of pay be $7\frac{1}{2}$ d. per thousand ens, the cost of setting, per sheet, will be $7\frac{1}{2}$ d. \times 60 = 450 pence = £1 17s. 6d.

For bookwork composition a "Ready Reckoner" may be obtained from the London Society of Compositors, which gives the value, ready calculated, of various numbers of lines, of different lengths, and in various-sized type. Such tables would occupy more space than we could here afford.

In practice, in order to arrive at the earnings of a com-

positor on piece, it is usual in most places, instead of reckoning up the exact number of ens, to ascertain what number of lines of the work composed is equal, or most nearly equal, to a thousand ens; and this quantity is often called "an hour's work," whether the compositor, in fact, takes more or less than an hour to set it. Having fixed this figure, all that has to be done is to divide the total number of lines by it and you get the number of "hours' work" (or thousand ens), and by multiplying the result by the rate per hour (or per thousand ens) you get the sum payable.

In news offices, to save trouble, a list is generally printed of the prices of composition by the line, so that instead of turning his matter into "hours" or thousands, the compositor simply counts the number of lines and charges accordingly. For instance, a newspaper set to a 15-em measure might pay as follows:—

Lines.	Long Primer.	Bourgeois.	Brevier.	Minion.	Nonpareil.
	S. D.	S. D.	S. D.	S. D.	S. D.
1	0 0 $\frac{1}{4}$	0 0 $\frac{1}{4}$	0 0 $\frac{1}{4}$	0 0 $\frac{1}{4}$	0 0 $\frac{1}{5}$
2	0 0 $\frac{3}{4}$	0 0 $\frac{3}{4}$	0 0 $\frac{3}{4}$	0 0 $\frac{3}{4}$	0 1 $\frac{1}{5}$
3	0 0 $\frac{3}{4}$	0 1	0 1	0 1	0 1 $\frac{3}{5}$
4	0 1 $\frac{1}{4}$	0 1 $\frac{1}{4}$	0 1 $\frac{1}{4}$	0 1 $\frac{1}{2}$	0 2 $\frac{1}{5}$
5	0 1 $\frac{1}{2}$	0 1 $\frac{3}{4}$	0 1 $\frac{3}{4}$	0 2	0 2 $\frac{3}{5}$
6	0 1 $\frac{3}{4}$	0 2	0 2 $\frac{1}{4}$	0 2 $\frac{1}{4}$	0 3 $\frac{1}{5}$
7	0 2	0 2 $\frac{1}{4}$	0 2 $\frac{3}{4}$	0 2 $\frac{3}{4}$	0 4
8	0 2 $\frac{1}{4}$	0 2 $\frac{3}{4}$	0 3	0 3 $\frac{1}{4}$	0 4 $\frac{3}{5}$
9	0 2 $\frac{3}{4}$	0 3	0 3 $\frac{1}{4}$	0 3 $\frac{3}{4}$	0 5 $\frac{1}{5}$
10	0 3	0 3 $\frac{1}{2}$	0 3 $\frac{3}{4}$	0 4	0 5 $\frac{4}{5}$
20	0 6	0 6 $\frac{3}{4}$	0 7 $\frac{1}{2}$	0 8	0 11 $\frac{3}{5}$
30	0 9 $\frac{3}{4}$	0 10 $\frac{1}{2}$	0 11	1 0	1 5 $\frac{1}{5}$
40	1 1	1 1	1 3	1 4	1 11 $\frac{3}{5}$
50	1 4 $\frac{1}{4}$	1 6	1 6 $\frac{3}{4}$	1 8	2 5 $\frac{1}{5}$

News hands frequently make up their bills in the following form :—

Compositor's Name,.....

Date,.....

Folio.	Name of Article.	First Word.	Last Word.	No. of Lines.			Time.
				Non.	Min.	Bour.	
2,3	Shah	In	fty		23		
11	Pars	Mr.	cent	14			
17	Money	Money	act			17	
15	Pars	The	19,500	6			
	General	The	income	11			
	Foreign	The	fund			12	
	General	The	town	12			
	Markets			72			
	Punch	A	would	17			
	Court	The	ystdy	5	15		
	Mk Lane	From	harvest	20			
	Comics	From	mails	11			
	Pars	At	evening		29		
				168	67	29	

We will suppose that the prices paid in the office are, nonpareil, 4s. ; bourgeois, 2s. 6d. ; and minion, 3s. 2d. per 100 lines.

Then, as the charge for 100 lines of nonpareil is 48d., the charge for each line is $\frac{48}{100}$ d., and the charge for 168 lines will be—

$$\frac{48 \times 168}{100} = \frac{8064}{100} = 80.64d. = 6s. 9d. \text{ nearly.}$$

In like manner the 67 lines of minion will cost $\frac{38 \times 67}{100} = 25.46d. = 2s. 1d.$; and the 29 lines of bourgeois will cost $\frac{30 \times 29}{100} = 8.70d.$, say 9d. So the total bill will be 6s. 9d. + 2s. 1d. + 9d. = 9s. 7d.

In newspapers a halfpenny is charged for any residual fraction up to $\frac{50}{100}$, and a penny for any residual fraction exceeding $\frac{50}{100}$. A rate for time corresponding to the piece prices quoted would be 10d. per hour, 5d. per half-hour, 3d. per quarter hour, and a penny for each five minutes.

Apprentices are sometimes paid two-thirds or three-fourths of journeymen's wages. It is obvious that they calculate in the ordinary way and deduct one-third or one-fourth.

BOOK III.

PRESS WORK.



PART I.

MACHINERY AND MATERIALS.

CHAPTER XLVIII.

PRESSWORK.—Its Nature and Object—Different kinds of Printing Presses—Hand Presses—Mechanical Presses—Classification.

PRESSWORK is that branch of the art of printing which deals with the obtaining of impressions from formes. The modes in which these are obtained are outlined in Chapter II. We have now to treat of the art in detail, and when we have done so it will have become apparent that it is an art which requires both the exercise of a thoughtful mind and the application of deft fingers. The operatives who devote themselves to it are called "pressmen" and "machine managers." These terms are the names of two different species of the same genus, the genus itself having no special name. In America, however, the term "pressmen" indicates the whole class of workmen who attend to press work, and it is often used here with the same meaning.

Classification of Printing Presses : Division 1.—Printing Presses, as stated in Chapter II., are of two main classes : (1) Hand presses, and (2) Presses worked by rotary gearing. The first named are "Presses" proper ; the second are in this country called "Printing Machines," or, shortly, "Machines," but in America the word "press" covers both kinds. The operatives who work the hand press are
(557)

called pressmen, and those who look after machines are called machine minders to distinguish them from the hand pressmen.

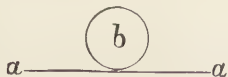
The hand press is the original device for obtaining impressions. It has been modified and improved from time to time, but in principle it remains the same as it did at the birth of the Art of Typography.

The machine worked by rotary gearing is not a hundred years old : it has undergone wonderful development, and has almost entirely superseded the hand press.

Division 2.—Having regard merely to the mode in which the pressure is given and received, printing presses (using the term in a generic sense) may be divided into three classes, which embrace both those worked by hand and those worked by power, *viz.* :—

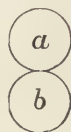
Class 1.—Here the forme lies on a *flat table* or *bed*, and the impression is given by the pressure of another *flat surface* called a *platen*: thus $\overset{b}{\text{—————}}\underset{a}{\text{—————}}$; *a a* is the type-bed, and *b b* is the platen. The horizontal position is the usual, as indeed it is the original one ; but in some machines the bed is vertical or more or less inclined, the platen of course meeting it in the same plane. All hand presses are of this class, and some “machines,” called “platen machines.”

Class 2.—Here the type-bed is flat, but the impression is imparted by the *curved surface* of a cylinder which is made to pass over it, as in the annexed figure, where *a a* is the type-bed and *b* is the impression cylinder. This class may be divided into two sub-classes: A, where the type-bed is a fixture and the cylinder imparts the impression while rolling over it ; and B, where the type-bed moves to and fro under the cylinder, which revolves on its stationary axis at the same time, and thereby gives the impression. Instances of machines, or



rather apparatus, of sub-class A are the roller galley press, an illustrated description of which is given on p. 594; the Cox-Duplex press, an American machine; and "Butterfield's Patent," made by the Cropper-Minerva Machines Company of Nottingham. One of the early cylinder machines for jobbing work—the Ulverstonian, now quite obsolete—was made on this principle. To sub-class B belong all the ordinary printing machines now used for book printing and large jobs and newspapers of small circulation.

Class 3.—Here the type-bed is constituted by the circumference of one cylinder, while the impression is given by the circumference of another as the two revolve one upon the other, as in the figure annexed, where *a* is the type-carrying cylinder, and *b* is the impression cylinder. In this case the forme is obviously curved to fit the circumference of the cylinder. Formerly this was accomplished by making the cylinder which held the forme very large (6 or 8 ft. in diameter), so that the curve was slight; nowadays it is usually achieved by taking a stereo mould of a flat forme, placing it in a curved casting box, and casting therein curved printing plates, which are afterwards affixed to the circumference of the type cylinder. To this class belong the fast newspaper machines called "rotary machines."



Division 3.—There is a third way in which printing presses may be classified, *viz.*, according to the state in which they leave the paper fed into them. According to this mode of reckoning, there are two classes: (1) Those presses and machines in which the sheets leave them printed on *one side*, and (2) those in which the sheets issue printed on *both sides*. To the first class belong all hand presses, and all ordinary platen and cylinder machines. To the second belong the rotary newspaper machines before mentioned, and a certain class of book-printing machines with

(generally) two impression cylinders. Machines of the first kind are called "single-side machines;" machines of the second kind are called "perfecting machines."

Division 4.—A fourth division is one based on the number of colours printed at a time. According to this there are (1) single-colour machines, a class which embraces all hand presses and the great majority of printing machines; (2) two-colour machines—those in which the inking arrangements are such that a sheet may be printed partly in one colour and partly in another before it leaves the machine; and (3) multi-colour machines—those in which the sheet is impressed with three or more colours at a time.

Division 5.—A fifth division rests on the number of sheets that may be fed into the machine at a time. In all hand presses, and nearly all cylinder machines, only one sheet is fed in and dealt with at a time; but in some old-fashioned platen and some cylinder machines two sheets are dealt with simultaneously; while in the fast newspaper machines of forty years ago four, six, eight, and ten sheets were so dealt with. Such machines were called *two-feeder*, *four-feeder*, *six-feeder*, and so forth.

Modes of Imparting Impression.—In the hand press and the platen machine what is required is to make the platen approach and press a sheet of paper on to the forme on the type-bed, and then recede to its original position. In the original hand press this was achieved by means of a screw operated by a long bar or lever inserted in it. By pushing the lever one way the screw caused the platen to descend, while by pushing it the other way the screw caused it to ascend. This was obviously a slow and unsatisfactory mode, so in the course of time the lever operated not a screw but other levers, and by their motion the platen was made to move up and down. The application of one or more springs helped to perform this

work, which was accomplished with greater ease, speed, and precision than on the old screw press.

In platen machines the platen is made to approach the type-bed by reciprocating gearing actuated by a main shaft carrying a fly-wheel, which shaft is kept revolving by foot, steam, or other power.

In the ordinary single-side cylinder machine there is a fly-wheel attached to a main shaft, which is made to revolve constantly by hand, foot, steam, or other power, and this imparts motion to various wheels and rods, whereby the type-bed is made to move to and fro under the cylinder, and the cylinder at the same time to revolve over it.

In the rotary machines there is no to-and-fro motion; the two cylinders roll over one another continuously, the paper being automatically fed in between them. It is from this continuous motion that rotary machines derive their great speed.

The different kinds of impression obtained are to be noted. In all platen machines the entire forme is printed at one and the same moment; in all cylinder machines the impression is imparted gradually, that is, the impression begins at one edge of the forme and is continued to the other edge, each part of the forme being printed successively as contact is made between it and the periphery of the revolving impression cylinder.

The reader will do well to study the illustrations of the different kinds of presses given in Chapter II., and in the other parts of this work.

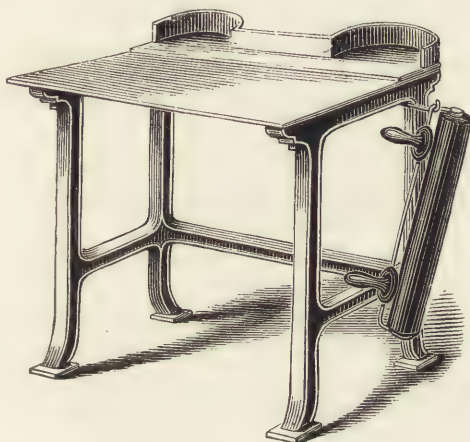
CHAPTER XLIX.

INKING ARRANGEMENTS.—Ink Tables—Putting out the Ink—Distributing—Inking—Rollers.

THE various modes in which the impression is taken having been discussed, we have now to show how the ink is imparted to the forme. As already stated in Chapter II., it is usually spread out either on a plane surface called an ink table (which is the usual plan) or on revolving cylinders or drums, and it is thence transferred in proper quantity to the types by means of rollers. We say in proper quantity, for it is of the greatest importance in printing that exactly the right quantity of ink should be imparted to the printing surface. Should there be too much, the sheet will be blurred and smudgy; should there be too little, some parts of the impression may not be recorded, or, if recorded, will be too faint. Moreover, it is essential to good work that every part of the impression should be evenly inked; that is to say, there must not be full colour in one place and light inking in another; and again, where bookwork is concerned, every forme should have the same kind and quantity of inking, so that the appearance of the work may be even throughout. In nothing is the difference between good presswork and bad more apparent than in the inking.

Inking Appliances for Hand Presswork.—When the hand press is used the ink table is a separate piece of plant, placed near to the press itself. The usual form of it is that shown in the engraving; but there is a smaller kind of table which stands on a pillar, and is called a “pedestal ink table.”

The ink is taken out of the can by a kind of iron trowel, called an *ink slice*, or a blunt, long, flexible knife called a *palette knife*, and is placed in daubs in and near the recesses shown in the cut; thence it is transferred to various parts of the table by means of a rubber of wood or glass called a *brayer*, and the final distribution is given by a roller of the form shown in the engraving, which is a wooden cylinder covered with a smooth and elastic substance made of treacle and glue, or of glycerine with various compounds,



BRAYER INK TABLE.

and called "roller composition." The pressman holds this roller by its handles and rolls it in the ink up and down and across the table until the surface is quite evenly covered. This operation is called "distributing." The same roller is then used to impart the ink to the forme, the pressman rolling the surface of the type all over, taking care that no part of it has more or less than its proper share. This is called "inking the forme."

Some tables are made to dispense with the brayer. Along the edge where the recesses are shown, is placed

a trough, one side of which consists of an iron cylinder capable of revolving. The ink is placed in the trough, or "duct," or "fountain," as it is called, the back of which is movable and can be adjusted by set screws, and these screws regulate the closeness with which a knife edge approaches to the cylinder. The cylinder itself is made to revolve by a handle at the side. The cylinder turns round in the ink, and receives at each revolution a certain amount of it, varying according to the proximity of the knife edge. The hand roller, covered with composition, is run up to the cylinder, until it gets from it a portion of ink, which is then distributed, and there is no braying out required. The duct containing the ink is covered over with a lid to exclude dust.

Ink tables are usually made of iron, but metal being injurious to many kinds of coloured inks (even a polished iron surface causing bright colours to be dull in printing), *slabs* of various kinds are used, which are laid over the table. Porcelain, lithographic stone, marble, and slate may be adopted. The last named, if firm, is equal to marble, but it is open to the objection—which, indeed, applies to some of the other kinds—that it cannot be heated, with the view of making the ink thinner, so as to work better in cold weather.

Before the introduction of the roller, the ink used to be imparted by means of balls of skin stretched over padding, and each having a handle attached to its upper surface. These "pelt balls" had to be manipulated one against the other, to obtain proper distribution, and their use involved much skill.

Inking Appliances in Machines.—In all machines—as distinguished from hand presses—the ink table, or ink drum, is placed in juxtaposition with the type-bed, and in conjunction with it is a duct, similar to that in the cylinder ink table above described. The annexed diagram gives a general

idea of the usual arrangements, simplified for the present purpose of instruction.

The Duct (D) is a long narrow trough for containing ink, placed usually at the extreme end of a machine, directly over the ink table. It consists of a solid iron roller which revolves when the machine is running, and of its back or bottom, which is usually a movable part, and which may be wholly removed for the purpose of cleaning. This back, which is technically called the knife, should fit absolutely true to the duct roller, the quantity of ink delivered to the forme depending upon the distance the knife is set from the roller,

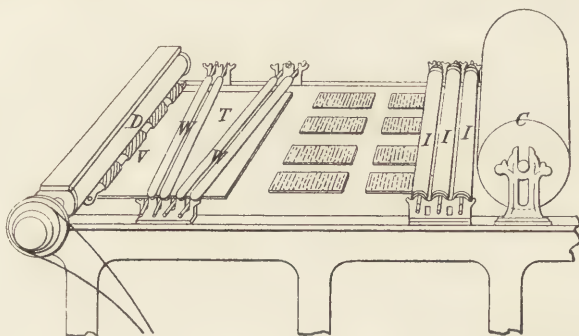


DIAGRAM OF COMMON INKING ARRANGEMENTS.

and this setting is arranged by means of the screws which are fitted in the back of the knife for that purpose. On a double demy machine, for instance, there are about five pairs of screws. These screws have different functions; five of them would be what are called draw-screws, and are made with a shoulder, and when tightened up pull the knife away from the roller, thus letting out more ink; whilst the others, which are called set-screws, keep the knife in the position to which it has been drawn by the draw-screws. Therefore, if we wish to let more ink out, we loosen the set-screws and tighten the draw-screws, and *vice versa*.

Next to this is the *vibrator* (v), so named because it moves or vibrates between the inking cylinder and the table (t), alternately touching first the one and then the other, thus carrying from the former a regulated supply of ink to the latter.

The ink table being joined to the type-bed, and placed on the carriage, moves with it backwards and forwards.

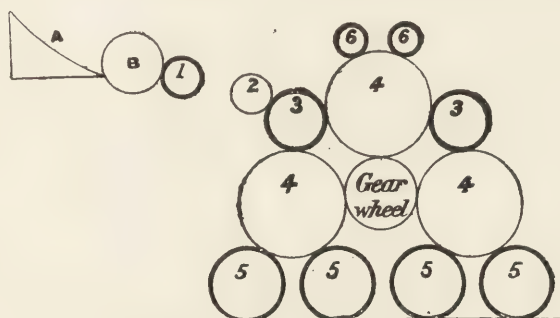
A short distance from the vibrator are placed a series of distributing rollers (w), which distribute the ink on the table. They are set diagonally, and from their peculiar motion are called *wavers*. They are fixed in metal sockets, or *roller forks*, and never come in contact with the forme.

The next set of rollers are called the inking rollers, or *inkers* (l). In its motion to and fro the ink table passes under these rollers, and from it they receive their ink after it has been distributed by the wavers, and convey it to the surface of the forme. The ink table, as it moves towards the cylinder after having been run out to its full extent, first comes under the vibrator, then under the wavers, and then under the inking rollers, while the forme of type passes twice under the inking rollers for each impression—namely, once when the carriage runs out, and a second time when it runs in again.

What have been described are the inking arrangements of the cheaper single-side cylinder machines ordinarily used, but in the more expensive kinds they are more complicated, though in the main similar. In the ordinary machines the inkers are made to revolve merely by the friction of the ink table and forme running under them; in the high-class machines they are usually revolved by independent gearing: then there are generally more of them and more distributors, and the main rollers carry on their tops other and smaller rollers—generally of iron—called “riders,” to assist in the perfect distribution of the ink, and these riders are often worked by gear. Again, the distribution is assisted by one or more

drums or cylinders of iron which revolve by gear, and have also a lateral motion to and fro along their axes.

We have already stated that in some high-class machines the table is now dispensed with, cylinders or drums taking its place. A diagram illustrating machines of this kind and showing the inking arrangements of the "British Fine Art Press" is annexed. *A* and *B* form the ink duct, the ink cylinder having adjustments controlling its revolution for varying quantities of ink. 1 is the "vibrator," which takes the ink from *B* and passes it on to the steel roller 2, which is itself in contact with one of the connecting composition



PYRAMID INKING ARRANGEMENTS.

rollers 3 3. These connectors join together the three steel drums, 4 4 4, which are driven by gearing in such a manner that their circumferential surface runs in perfect unison with the type-bed; these drums are also made to reciprocate in opposite directions and at varying distances, thus thoroughly breaking up and distributing the ink. The inkers 5 5 5 5, which are of large diameter, are always in contact with the drums, and are capable of very fine adjustment. The two rollers 6 6 are additional distributors, and collect any dirt or fluff, keeping the work always clean and sharp.

The inking arrangements of perfecting machines are

similar to those of single-side machines. Some have ink tables and some the cylinder distribution before mentioned. In rotary machines there is never a flat table, distribution being always performed by cylinders or drums and rollers, (see the diagram on p. 603).

Rollers.—The forms of rollers will be seen on reference to the illustrations on pages 563, 580, 590, 602.

Press rollers consist of a core, or small roller, of wood, covered with composition, and each roller is held in a frame by means of a pin or bolt which passes through the core, secured by a nut in its place in the frame, and which forms the axis on which the roller revolves. The frames of all press rollers above a foot in length have two handles, as shown on page 563, but short ones have one handle only; these short rollers are used chiefly for proof-pulling (see the roller in the illustration on page 580).

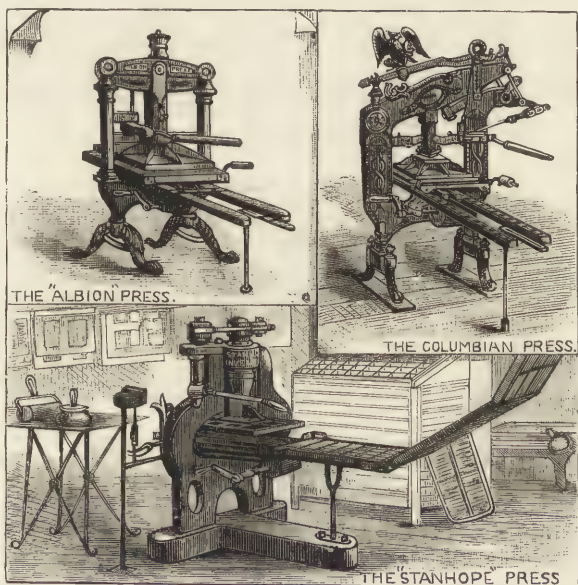
The rollers used on machines for distributing consist simply of long, straight rods or spindles of iron, covered with composition. Those used for inking the forme are larger in diameter, and they have generally a core of wood or hollow iron around the spindle.

The spindle or core of a roller is called the "roller stock." It is of great importance that the roller stock should form the true axis of the roller—or in other words, that it should run exactly down the middle, and that the composition should adhere firmly to it. These points have to be seen to when the roller is made or "cast."

CHAPTER L.

PRESSES OF THE PLATEN KIND.—*Hand Presses* : The Stanhope Press, the Albion Press, the Columbian Press, the Britannia Press, the Platen Galley Press.

IN this chapter we purpose describing shortly the successive hand presses. They are all of the platen system, and are



all now obsolete except for proof taking or for the printing of works of which very few copies are wanted.

The original press was, as we have seen, made of wood, and operated by a screw and lever. Some slight improvement was made in this press about the middle of the seventeenth century, when an iron lever with a spring was substituted for the old sort. This improved press was in use for about 150 years.



ORIGINAL WOODEN PRESS.

In the year 1800 a decided step forward was made by the production of an iron press, invented by the then Earl Stanhope. This was not only stronger and more durable, by reason of the material used in its construction, but a much larger forme could be impressed at a time, the platen being made considerably larger than in the old presses.

In all presses, as has been seen, it is necessary to have a

flat table, called a *type-bed* or *bed*, on which the forme rests, and the flat plane or platen which gives the impression.

But if the platen were always over the type forme, the inking of the latter and the laying on of the paper would be matters of great difficulty. Hence provision was made, even in the early presses, for withdrawing the bed from under the platen after each impression, thus leaving the type free to be inked and to receive the paper. In the Stanhope and all more modern hand-printing presses, the bed is mounted on an iron carriage, which is run in and out on rails or runners by means of a handle and two reversed bands, working on a wooden drum called a "rounce." When the handle is turned one way the carriage moves towards the platen, and passes the bed under it until it reaches the position in which the type should receive the impression. When the handle is turned the reverse way the carriage recedes, and goes to the far end of the rails or runners.

Again, it is very desirable to have some arrangement whereby the sheet may be accurately laid on the type. For this purpose a kind of leaf or flap is hinged to one end of the bed, and the paper is fixed upon it to certain marks when it is in an upright position. It is then turned down, and the paper comes upon the type in the exact position in which it is wanted.

This arrangement is called a *tympan*, a name acquired from its being like the top of a drum (*tympanum*). It consists of a thin frame of metal, over which parchment or cloth is stretched. The paper to be printed is laid upon this, and the bottom side of the tympan being jointed or hinged to the bed of the press, it is only necessary to turn it down, in order to bring the paper in contact with the type.

In the illustration of the Stanhope Press, the platen, and the horizontal type-bed with the tympan hinged to it, will readily be recognised. The way the press is used is

this. The plane or "platen," which rises and falls, always remains parallel to the parts that come beneath it. The plane or "bed," on which the type is laid, is to the right of the press. Hinged to its right side is the tympan. The sheet of paper is laid on that side of the tympan which faces the platen, and the tympan is turned down flat on the type which is placed on the type-bed. The latter then travels on the two rails until it comes under the platen, which, on the lever being pulled, comes down and gives the impression. After this the carriage is withdrawn, the tympan lifted, and the printed sheet removed.

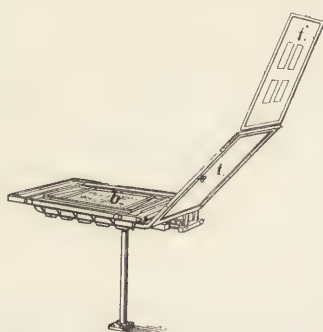
In the illustration is another and higher flap hinged upon the tympan. This is called the *frisket*, and its uses are chiefly to hold the sheet and prevent it from falling, and to prevent the margins of the paper being soiled, as will be explained hereafter. After the sheet has been placed upon the tympan, the frisket is folded down upon it, and both together are folded down upon the type forme.

The annexed diagram shows a type-bed, *b*, with tympan, *t*, attached to it, and frisket, *f*, attached to the tympan.

The frisket is cut to allow of four pages of type being printed.

This arrangement of platen, carriage, bed, tympan, and frisket is the same in all the hand presses; the only difference between them lies in the mode in which the power is acquired for bringing down the platen.

It needs hardly to be said that the larger the forme is the larger the platen must be, and in proportion as these are large so must the power be for giving the impression. It will obviously be easier to take an impression of a square



BED, TYMPAN, AND FRISKET.

inch of type than one of a forme measuring a square yard. For this reason platens in the old days were small, and when the forme was large part only at a time was brought under the platen; and hence, inasmuch as many formes required two pulls, the ancient press was often called a "two-pull press."

The Stanhope Press.—Lord Stanhope, however, not only strengthened the platen, by ribbing it as shown in the illustration, but, by devising a system of levers, enabled a man with one pull to give a sufficient impression to a forme of considerable size.

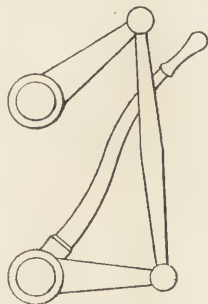


FIG. 1.

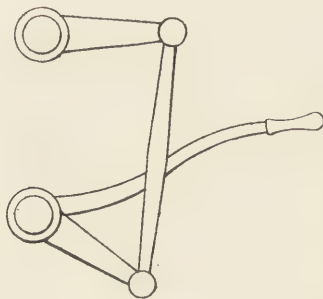


FIG. 2.

STANHOPE LEVERS.

The arrangement of these levers is shown in Fig. 1 and Fig. 2, but in the press itself they are placed horizontally. The handle moves on a pivot close to the pressman. At the outer edge or staple of the press is an upright pillar or arbour, its lower end resting on a pivot, its upper being held by a top plate through which it passes. The handle then acts through the series of levers on the screw, and on the platen attached to it. When the latter is raised, the arrangement is as in Fig. 1. But when the pressman has pulled the handle into the position shown in Fig. 2, the platen is depressed and presses the forme.

By this arrangement the levers are, at the time of impressing the sheet, in the position when most power is given out, and when most power is wanted. In the descent of the platen, at first merely motion is required; after that, power. The old presses which the Stanhope superseded were screwed up and down with equal velocity and power throughout all parts of their travel.

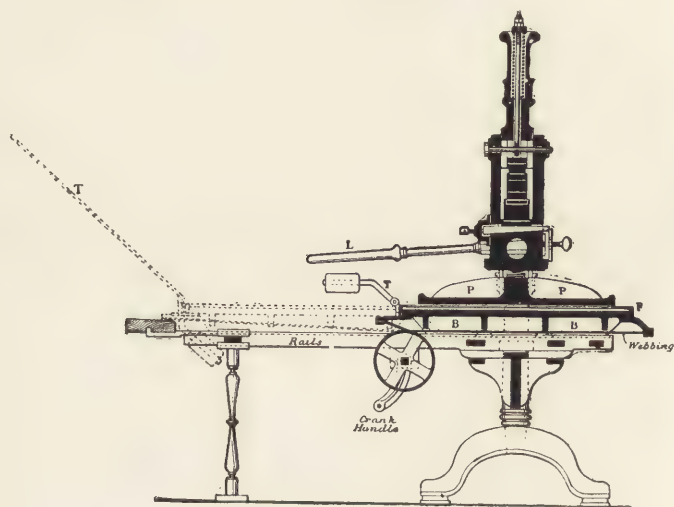


DIAGRAM OF THE ALBION PRESS.

L is the Lever or Handle. PP the Platen. T the Tympan, under the bed (the dotted lines show it when run out). F the forepart of the tympan, on which the frisket hinges. BB the Bed.

With the Stanhope press about 200 impressions could be taken in an hour. Examples of it are occasionally still to be met with doing work in printing offices.

The Albion Press.—This was an improvement on the Stanhope, and was invented by Mr. Hopkinson, of the firm of Hopkinson & Cope, about the year 1824. From the illustration on page 569, and from the annexed diagram,

it will be seen that the works are supported on a frame consisting of two uprights and a cross-piece, which is called the *staple*. This, as well as the other parts, excepting some which will be named, is of iron. The staple stands on two sets of ornamented *feet*, screwed to pieces of wood which stand on the floor. The top is sometimes called the *frame head*.

Rather more than half way down the frame there is a cross-piece, on which are laid the *ribs*. The latter are the rails on which the carriage which holds the bed, with tympan attached, travels. At the extremity of the ribs is the *rib leg*, which serves to steady them, and to support the weight of the carriage. Between the two ends of the ribs furthest from the staple there is the *bolster*, the object of which is to prevent the carriage running too far out, or off the rails or ribs.

The carriage is driven forward and backward by being attached by two *girths*, or strong bands of leather or cloth called webbing, to a wooden cylinder called the *rounce*. One of these girths is so fixed that it will pull the carriage in one direction, and the other so that it will pull it in the opposite, the rounce being turned round first so that it will cause the carriage to be impelled towards the platen, and then so as to withdraw it, and send it to the end of the ribs. The rounce is turned by a handle, called the *rounce handle*.

The upper surface of the carriage is covered by a strong plate of iron, planed perfectly level, which is called the *bed*, or *coffin*.

Hinged to the end of the carriage farthest away from the frame of the press is the *tympan*, already referred to. In order, however, to break the force of the descending platen, and so prevent the type being injured by the impact, the tympan is utilised to contain a soft yielding material such as blanket or cloth, or paper, which used to go by the

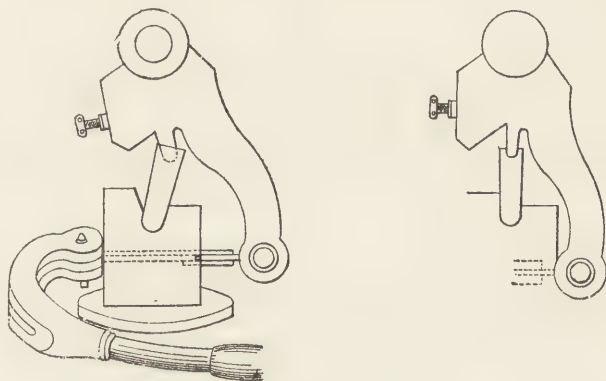
name of the *blanket*, whatever it consisted of, but is now called the *packing* of the tympan. This is effected by making the tympan to consist of two parts, respectively called the *inner* and *outer* tympan. The first has a lighter frame of metal than the latter, and fits into it. The two are fastened together by *tympan hooks*. At the end of the tympan frame a heavy weight is placed, as a sort of counterpoise. When the tympan is being lifted, this facilitates the operation very materially. At the side of the outer tympan frame are "point screw" grooves, in which are fixed points for "registering" bookwork. Their use will be described subsequently.

Above these parts will be seen the *platen*, which is perfectly smooth and level on its under surface, in order to give the whole of the type forme an equable pressure. It is strengthened by heavy radiating plates cast in the same piece with the platen, which prevent it from "giving" in any part. The spaces between these plates, on the upper side of the platen, are called the *tills*. The parts which effect the working of the platen may be divided into two classes, one regulating its descending and ascending motion, and the other being that which causes the motion. The platen, as we have already stated, must always be in a plane parallel to that of the table. It must have no lateral motion whatever. The slightest vibration, too, would cause the impression to be duplicated, and destroy its clearness; or, as printers say, would cause a "slur." Hence there are guide plates fixed into the frame, which correspond in shape with that part of the mechanism immediately over the platen. They consist of two projecting pieces of iron, wedge-shaped, to fit into the grooves of a projection on the piston.

The platen itself is pushed up and down by means of the *piston* (the piece running vertically downwards from the head). This is connected with a system of levers. The

power is gained by causing an inclined piece of steel to become perpendicular. In doing so, the platen is forced down, and the impression takes place at the moment the piece of steel occupies a vertical position. This piece of steel is called the *chill*, and it is shaped like an elbow. At the other end a rod is fixed to the *bar*, which, on being pulled towards the operator, straightens the chill, or brings it into the vertical position, and sends down the platen.

The arrangement will be understood by reference to the accompanying figures. In the first diagram the position



CHILL OF ALBION PRESS.

of the chill is shown when the platen is raised; in the second, when it is brought down on the forme. The screw is altogether discarded in this press.

The chill is straightened by a lever, fastened to a projection of the frame, which forms its fulcrum. This lever is actuated by the pressman's arm.

That part of the frame against which the handle of the elbow is brought is called the *cheek*. The term is, indeed, sometimes applied to the two sides of the upright frame to distinguish them from the head. The end of the *bar* is called

the *bar handle*. The whole is hung upon the *main bolt*, running through the head of the frame.

In order to effect the return of the platen, that is, to raise it up again, there is a powerful helical spring in the spring-box placed within the ornament at the top of the press seen in the view. This spring is connected with the other part by links and steel bolts. It also brings back the handle after the pull is made.

The degree of pressure given is regulated by the *pressure steel*, which is wedge shaped, and acts upon the chill, on being screwed by the *pressure screws*, more or less forward. This screw is also shown in the diagrams on p. 577.

The Columbian Press differs from the Albion Press chiefly in the nature of the levers which give the impression. The pulling bar is elbowed, and there is a diagonal connecting rod. The rod changes the horizontal movement of the bar into a vertical one by a link connected with the head, which itself becomes a powerful lever. The platen is attached to this by a strong iron bar, the descent being made steady and regular by two iron girders, which project from the cheek. The Stanhope levers are adopted in principle, but their power is greatly increased by the mode in which the long arm is brought down by the rod. The eagle at the top is a weight to cause the platen to rise again after the impression has been effected.

In fuller detail, these arrangements are as follows :—

At the top of the frame there is bolted to one of the uprights a heavy lever called the *beam*—the ornamental crosspiece shown in the engraving. It is kept in position by the counterpoise lever on which is placed the eagle. To the heavy lever in the centre is attached the piston, and to this latter, at the lower end, is bolted the platen. This is perfectly level on its under surface, but the upper part is strengthened by ribs or plates radiating from the centre. The spaces between the plates are called the *tills*.

The broad heavy lever at the top is, by a piece of iron called a *link*, joined at one end to another lever of angular shape. From the other end of this angular lever proceeds horizontally a straight iron bar called a *connecting rod*, which is joined at the other end by a pin to the bar handle. This handle is fixed to the upright of the press, seen at the left in the engraving. When it is pulled toward the pressman, it pulls the connecting rod with the angular lever forward also, thereby making this lever turn downward on its bolt. In doing this the main lever at the top is depressed at the same time, and consequently the connected piston and platen descend also, causing the impression.

When the handle is allowed to return, two heavy counterpoise levers, one at the head and the other behind the press, cause the main lever to ascend again.

Regulation of Power.—The connecting rod between the bar handle and the lever is in two parts, fitting into a wormed socket. The rod can be extended by turning round one part in its screwed socket, first removing the pin attaching it to the handle. If screwed further in, it shortens the distance between the two parts, and increases the pull. If screwed outwards, an opposite effect is produced. A screw situated in the cheek or frame of the press can also be used to increase or diminish the distance the bar handle itself has to travel, thus increasing or decreasing the pull.

In the first half of the nineteenth century, books, and even small country newspapers, used to be printed on the Albion and Columbian presses, or others like them (such as the Britannia press often found in the North of England). Now, however, as has been stated, hand presses are used only for pulling proofs or printing small numbers. They used to be worked by men called *pressmen*, operatives of a type now all but extinct.

Sizes of Presses.—Presses are made to certain sizes, designated according to the largest sheet they are intended

to print. Thus, a double-crown press will print any sized forme up to a double-crown one. The Albion press, however, always prints one size larger sheet than it is said to be made for; thus, a double-crown press will print a double-demy sheet.



THE PLATEN GALLEY PRESS.

The following are the names of the different sizes of Albion and Columbian presses, and the dimensions of their platens:—

	Inches.		Inches.
Foolscap Folio	- 15 by $9\frac{3}{4}$	Royal	- 26 by $20\frac{1}{2}$
Post Folio	- 16 „ 11	Super Royal	- 29 „ 21
Demy Folio	- 18 „ 12	Double Crown	- 34 „ $22\frac{1}{2}$
Foolscap Broadside	19 „ $14\frac{1}{4}$	Double Demy	- 36 „ 23
Crown Broadside	- 21 „ 16	Double Royal	- 40 „ 25
Demy	- 24 „ 18		

Quarto or Amateur presses are also made. Their platens are 10 in. by 7 in. These, as well as the foolscap folio, require to be set up on a table or stand.

The best kinds of Albion presses have steel chills; the second quality have cast-iron chills. The bolts should be of steel, and generally the best iron should be used.

It is advisable that each press should be supplied with an extra spring and extra platen bolts in case of accident.

Presses are made for travelling purposes, in which the frame or staple, the most cumbrous part, is made in two pieces.

The Platen Galley Press.—This press is used, as its name implies, for pulling proofs of matter on galleys. Its parts are very simple and few. The iron beam at the top is the lever that moves the platen. Underneath the latter a piece of blanketing is fixed to moderate the pressure on the type. When the handle is pulled downwards the platen descends, and the impression is effected. The ink table, on which the ink is distributed, is at the right-hand side, and underneath it is a hook on which the roller is hung. A shelf below the bed serves to hold the damp sheets of white paper on which the proofs are to be pulled. A movable piece of wood, forming a weight, presses the paper, and causes it to retain its moisture.

The galley of matter is placed on the table with the side which contains the quoins to the back, as shown in the engraving on opposite page.¹

¹ A great deal of type is damaged by an improper use of this galley press. There should be a strip of wood fixed to regulate the galley, so as to bring it exactly under the centre of the platen. When the galley is not altogether filled with type, a bearer should always be placed at one end. The handle should not be pulled down violently, but just sufficient to obtain an impression.

CHAPTER LI.

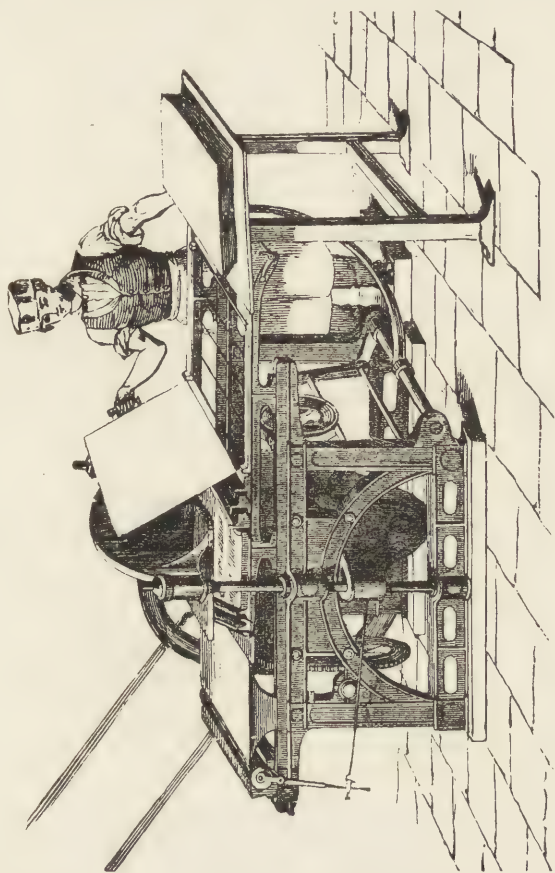
MACHINES OF THE PLATEN TYPE.—*Old Fashioned Power Platen Machines*: Single and Double—the Scandinavian—the Napier—Hopkinson and Cope's. *Treadle Platen Machines*: The Golding Jobber—the Minerva—the Mitre—the Bremner—the Improved Gordon—the Universal.

PLATEN MACHINES—*i.e.*, presses on the platen system, moved mechanically by rotary gearing—may be divided into two kinds: (1) the old-fashioned power platen machines and (2) the modern treadle platen machines.

Old-fashioned Power Platen Machines.—These, which are now very seldom met with, most closely approximated to the press. Two kinds were constructed, respectively known as single and double platen machines. Of the former the Scandinavian may be taken as the type. Of the latter there are the double-platen machines on the design introduced by Napier and on that of the firm of Hopkinson and Cope. Both kinds are now out of date, they having been superseded by the treadle platen machines for light work, and the cylinder machines for large formes.

The *Single-platen Machines* had one "end"; that is, the forme was placed at one end of the carriage, the other end being used as a distributing surface for the inking rollers. The platen was in the centre of the machine, and was brought down by mechanism connected with the main shaft. A heap of paper stood to the left of the machine-minder, and with his right hand he lifted up the tympan and placed upon it the sheet to be printed. He then depressed the tympan,

and the sheet was carried by the tympan over the forme, and received the impression from the descending platen. When the sheet was printed, the tympan frame returned to



"SCANDINAVIAN" SINGLE-PLATEN MACHINE.

its former position to have the printed sheet removed and a fresh one laid on. The rollers were attached in a suitable manner to the tympan frame, and thus ran to and fro

over the forme. In this machine the forme was always stationary. The whole apparatus was automatic in three respects only—the bringing down of the platen, the movement of the carriage under it, and the inking of the forme. In other respects it required the manual operations of the ordinary press.

In the *Double-platen Machine* the platen was also placed in the centre. The carriage, however, was divided into two parts, on each of which a forme was placed, and at the two ends were two inking tables and two sets of rollers. The piles of paper for each forme were placed on tables at the two ends of the machine. Two persons were required to lay on. This was done to tympan with friskets, which were raised and lowered automatically by mechanism. The carriage had a reciprocating (that is, backward and forward, or to and fro) motion, and as it proceeded in one direction it brought one forme with the superimposed paper under the platen, and as it returned the other forme, with its paper, also received an impression.

The double-platen machine, with its two coffins, two inking tables, two tympan and friskets, was, in fact, a double press in all respects save that it had but one platen or impression surface. The platen was worked by mechanism connecting it with the source of motive power. The arrangement for feeding the machine was the same as that of the hand press, the white paper being laid to marks or pieces of cork which served as guides.

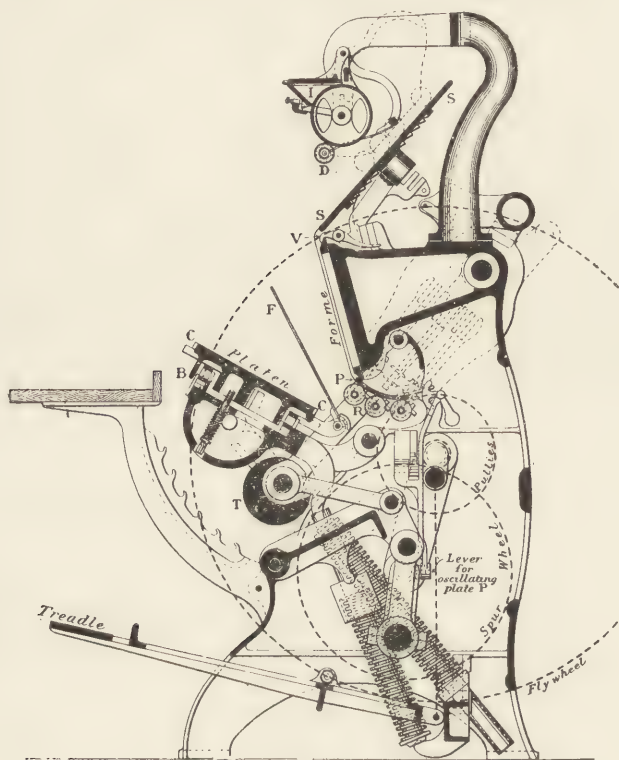
There were two kinds of double-platen machines, made respectively by Messrs. Hopkinson & Cope and Messrs. Napier & Son. In the Hopkinson & Cope machine the platen was worked by a crank shaft; in the Napier it was worked by knuckle joints. The advantage of this latter machine was that greater pressure could be obtained with less than half the driving power. In the former the platen received its motion from one side only, being actuated by

a cross beam secured on the other side. In the latter, the platen head was cast in one large piece and supported by means of two powerful rods, one on each side. These rods were worked by connecting rods extending from a shaft at the end of the machine. There were also improved arrangements in the Napier machine for inking. These machines did good work, but they are much too slow to be used now.

Treadle Platen Machines. — These were introduced about thirty-five years ago, and are now to be found in almost every printing office. They are made chiefly for jobbing work, the most usual sizes being foolscap folio, crown folio, large post folio, and demy folio. They may be driven by power or by treadle. The forme is placed in a perpendicular bed or coffin. The platen, unlike that of the hand press or the old platen machine, not only gives the impression, but receives the paper to be printed. In the upper part of the apparatus are placed the inking rollers. These receive their ink from an inking table or disc, which is supplied by a duct and its roller. The ink table or disc is placed at an angle of about 45 degrees. The inking rollers pass over the perpendicular forme, which is stationary, and ink it. While they are doing so the platen moves towards the operator so as to present itself at a suitable angle for the sheet to be laid on. The continued movement of the machine by the treadle sends the rollers back again to the source of the ink supply. The platen and the type surface are brought together, the sheet intervening, when the latter receives the impression. The process is then repeated. All the operations of printing are done automatically, the attendant being required only to lay on and take off the sheets.

A general notion of the style and arrangement of treadle platen machines will be gathered from the various cuts which illustrate this chapter, and especially from the

accompanying diagram (made by Mr. Powrie), which represents the "Reddish Jobber," a machine whose American prototype is known as the "Golding Jobber." The forme is secured by a spring clip in the recess, V. The ink is



THE "REDDISH JOBBER."

placed in the duct, I, which is adjustable by screws, and it is transferred to the circular plate, S, by the roller, D. The plate is partially revolved at each impression by a ratchet and pawl motion so as to distribute the ink equally

over its surface. The three rollers, R, which have no lateral movement, act both as distributors and as inkers; they distribute on the plate, S, and also take ink from it; they then pass right over the forme and ink it, and, in the "jobbers" mentioned, they further distribute on the curved plate, P, below the forme, which plate has a lateral motion imparted to it; then they pass a second time over the forme on their return to the plate, S, thus giving it a second inking. Meantime the operator, who stands in front of the machine, his foot working the treadle, has with his right hand taken a sheet from the board before him and placed it on the platen, its position being determined by guides, stops, or gauges affixed to the platen, or rather to the sheets of paper with which it is covered; the platen then moves forward to meet the forme, and as it does so the adjustable frisket forks, F, press the paper upon it and hold it firm, they being arranged to fall on a margin, or other place where no impression will be required. When the platen and the forme come into contact the printing of the sheet is done, the pressure being very great. The platen now recedes, the frisket forks open, and the printed sheet is removed with the left hand, while another sheet is being got ready to be laid on with the right. In the diagram are shown two large springs near the bottom of the machine: these are to counterbalance the weight of the platen; they are not found in many machines. T is a toggle lever arrangement helping to increase the pressure of the platen upon the forme.

It is of course necessary that the platen should meet the forme exactly in the plane of the latter, and to ensure this the platen is adjustable by screws and wedges. In some machines the platen advances on a hinge-like joint: this is undesirable, for with this motion there is only one position in which the platen and the forme can meet one another in the same plane, and the exigencies of printing often

prevent this position from being accurately reached, the result then being that one part of the forme (that near the bottom of the bed) gets more pressure than the rest and an accurate impression is impossible.

It frequently happens that a sheet is missed or is improperly laid, and in that case it is very desirable that the platen should not meet the inked forme. To allow of this the machines are fitted with a "throw-off" motion of one kind or another, so that when the necessary lever is pulled or handle turned—and this can be done instantaneously as the platen advances—an eccentric or other appliance so acts that contact between the platen and the forme is avoided.

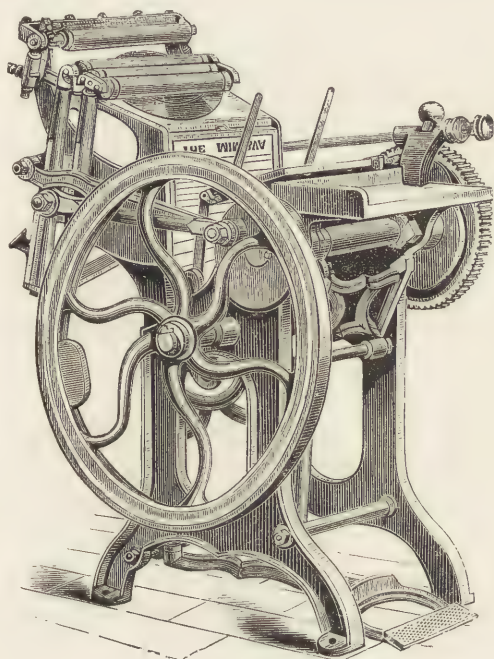
What is required in a treadle platen machine is: (1) rigidity; (2) solidity and evenness of impression; (3) good distribution and inking arrangements; (4) ease, accuracy, and swiftness of running; (5) a good throw-off motion, and (6) easy means of adjusting the impression. Certain machines possess some of these attributes in a more marked degree than others, and it is difficult to find any one which excels in all.

There are two classes of treadle platen machines in the market: (1) those whose special features are simplicity in construction, and rapidity and lightness in running, so that they may easily be operated by the foot; and (2) those which are designed to print larger formes and to print them with the best results; these are slightly more complicated, more heavily built, can only be driven at a profitable speed by power, and have extra appliances, especially for inking.

It is on treadle platen machines that most small jobbing work is now done. They are selected because they occupy comparatively little space, are easily made ready for work, and can be managed by boys with little oversight from a skilled pressman. There are very many kinds by various makers, more or less similar, and of these we give short

descriptions and illustrations of three as samples: the "Minerva" or "Cropper," the "Improved Gordon" or "Bremner," and the "Universal" or "Colt's Armory Press," as it is now often called.

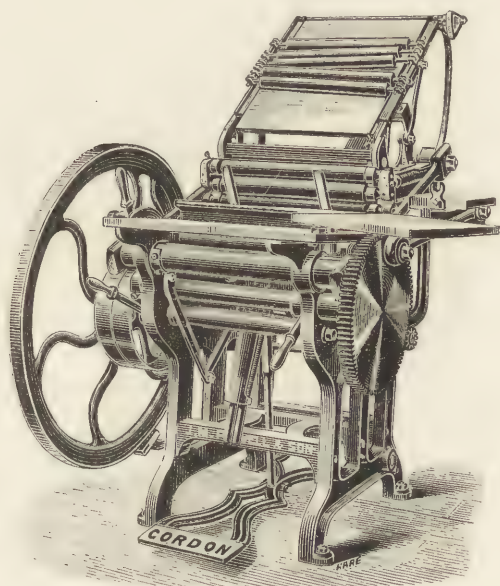
The "Minerva" is a type of the light-running machines,



THE "MINERVA."

and, but for slight improvements, is the original machine invented by Gordon and introduced into this country by Messrs. Cropper, whose name is often substituted for it—indeed, with some "Cropper" is a generic name for all kinds of treadle platen machines by whomsoever made. It will be noticed that in this machine the three rollers act both

as distributors and inkers, one of them also acting as a vibrator: the rollers have no diagonal movement, but distribution is assisted by two concentric circular discs which constitute the major part of the ink table and which turn in opposite ways. Should the sheet be improperly placed, the operator can by touching the ball attached to the rod on his right, shown in the upper part of the engraving, turn



THE "GORDON."

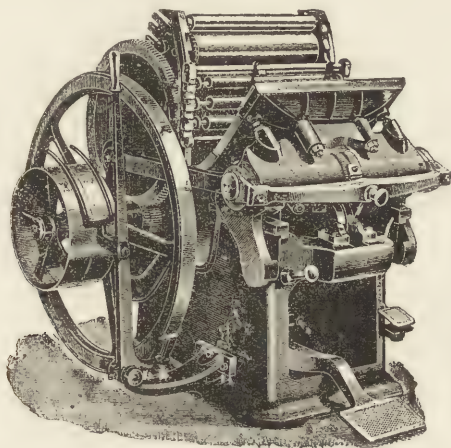
it and thereby instantly throw off the impression so that the platen and type do not meet, and by means of milled screws at the end of this rod the degree of impression can be readily regulated.

A modified form of the Minerva is shown on page 18.

The "Improved Gordon"—the "Bremner"—is almost identical—is a more solid machine than the Minerva and

has extra inking appliances. It will be observed that there is a larger ink table with no circular plate, that there is a vibrator, and that the distributing rollers are distinct from the inkers. In one of these machines there is a patent apparatus for giving double distribution and for enabling the forme to be twice rolled.

The "Improved Universal" or "Colt's Armory Press" is a type of the heaviest of the treadle platen machines; it is seldom used in less than demy folio size and is nearly



THE "COLT'S ARMORY PLATEN."

always driven by power. In it, and in the "Mitre"—a machine of the same class—a perpetually revolving cylinder or ink drum, with a lateral motion to and fro along its axis, takes the place of the flat ink tables in the other machines.

Sizes of Treadle Platen Machines.—Treadle platen machines are made in the following sizes: Royal 8vo (7 in. \times 11 in.), foolscap folio (9 in. \times 13 in.), crown folio (10 in. \times 15 in.), large post folio (11 in. \times 17 in.), demy folio (13 in. \times 19 in.), crown, and even demy. Of some

makes only one or two sizes are obtainable, and very few, if any, makers construct all the sizes above mentioned. The sizes in inches given above are the approximate measurements inside the cast-iron chases used with the machines, but these vary somewhat according to the make of the machine.

For foot power the foolscap folio is perhaps the size most generally useful, though a man or strong youth can easily treadle a crown folio ; for steam or gas power the demy folio is the favourite size.

CHAPTER LII.

CYLINDER MACHINES.—Different Kinds—Simplest Form, the Roller Galley Press—Single-cylinder Machines—Two-feeder Machines—Two-colour Machines—Perfecting Machines—the Applegath and Cowper—the Anglo-French Rotary Machines.

THE greater number of modern printing machines are cylinder machines—that great class which embraces single-side machines, perfecting machines, two (or more) feeder newspaper machines, and rotary machines. It is perhaps not wrong to say that of printed matter over 99 per cent. in point of quantity, and nearly as much in point of importance, is produced by such machines.

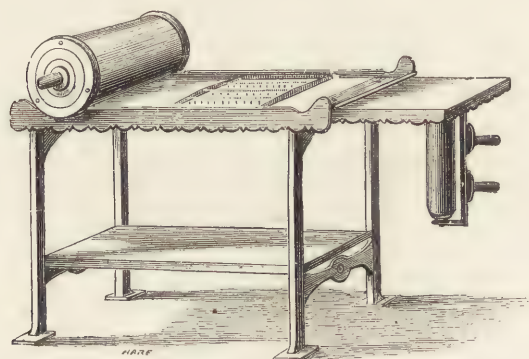
Although the term “cylinder machine” is applicable to all kinds of printing machines in which the impression is given by a cylinder, it is usually confined to those machines in which there is a flat type-bed, those having cylindrical type-beds being called “rotaries.”

Of cylinder machines the most usual and most useful for general purposes are the ordinary single-cylinder machines, for printing on one side of the paper only. Before we deal with these, however, we will describe the simplest form of a cylinder press—one found in nearly all newspaper, and in some book offices—the *Roller Galley Press*.

Roller Galley Press.—The nature of this apparatus will be gathered from the accompanying illustration. The framework supports the bed, on each side of which is a raised ledge. Over the latter runs a heavy cylinder, moved by a projecting handle and covered with blanket. The

galley is laid on the bed, the type inked, the sheet laid on, and then the cylinder is rolled along, when its weight causes the type to impress the paper, and a proof is taken.

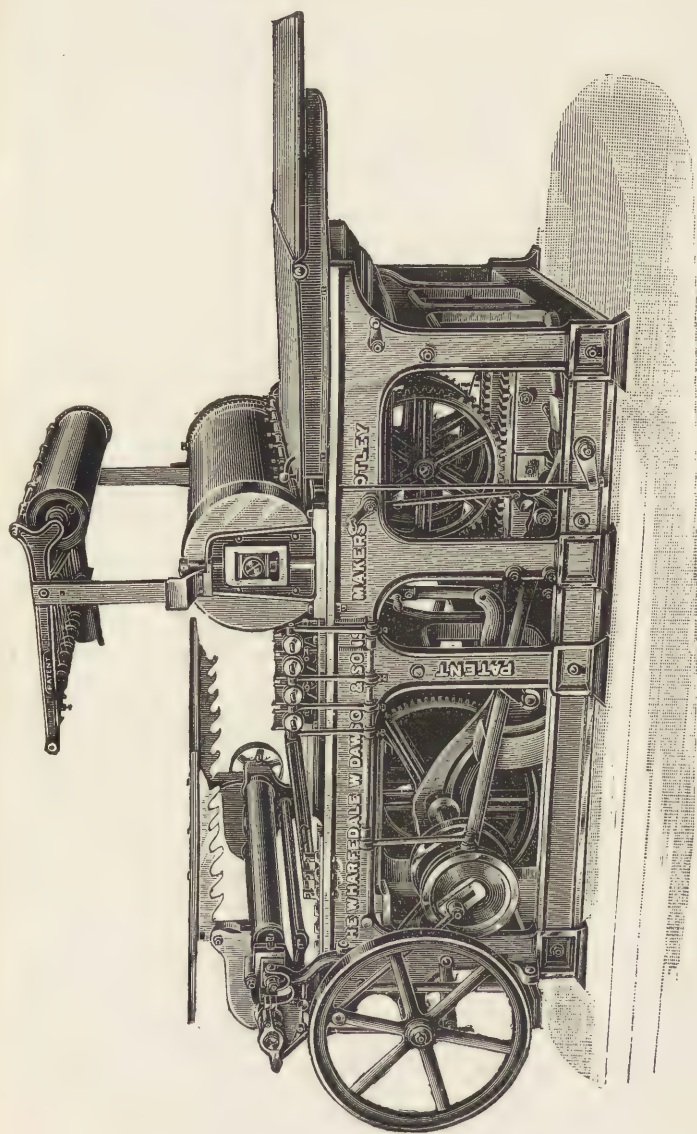
It will be observed that in this case the type remains stationary, while the cylinder rolls from one end of the apparatus to the other. In regular printing machines this sort of thing is reversed: the type moves on its bed to and fro, while the cylinder revolves on a fixed axis.



CYLINDER GALLEY PRESS.

As already stated, one of the earliest jobbing machines—the “Ulverstonian,” invented by Stephen Soulby—had a roving cylinder like that of the galley press. It is now quite out of date. Yet within the past few years a fast machine for newspaper printing, called the “Cox Duplex” press, and a small jobbing machine called the “Butterfield” have been made on the same principle.

Single-cylinder Machines.—The cylinder machines found in ordinary jobbing and book offices are of this kind. The general arrangement of such machines is indicated by the woodcut annexed; their working parts will be described in detail later.



THE WHARFEDALE SINGLE-CYLINDER MACHINE.

The machines have substantial frames strongly braced with cross stays. On the top of these are fixed runner bars or bowl rails for the anti-friction rollers which support the carriage or moving table of the machine.

In small machines there are two of these runner bars, but in larger sizes three or more, which form a support for the table and prevent it springing when under pressure. The carriage for the type bed, or "coffin," has rails cast on its under side, and moves on a series of small rollers, the carriage being propelled by an ordinary crank motion with a spur wheel at the connecting rod end, or by two wheels fixed on a shaft. These wheels gear into and roll on racks fixed to the frame of the machine, and also into racks secured to the under side of the carriage. By this arrangement the carriage is made to travel double the distance of the rack wheels, or four times the throw of the crank.

Near the centre of the machine is the cylinder, placed transversely. It revolves in adjustable bearings, usually made of brass or gun metal. It is fitted with grippers or mechanical fingers, which seize at the proper time the sheet of paper to be printed, hold it fast while being printed, and then release it when the operation is complete. A pile of paper is laid on a feeding board, shown at the right-hand side of the engraving. It is fed in to marks by the layer-on, seized by the grippers and carried round the cylinder, and then taken off, occasionally by another workman, but usually by automatic flyers, and laid on the delivery board, which is shown at the left-hand side of the engraving.¹


While the sheet has been carried round the cylinder it

¹ In this engraving there is shown the arrangement for automatically taking off the sheets, called a "flyer," and thus a boy called a "taker off" is dispensed with. Nearly all machines are now fitted with flyers.

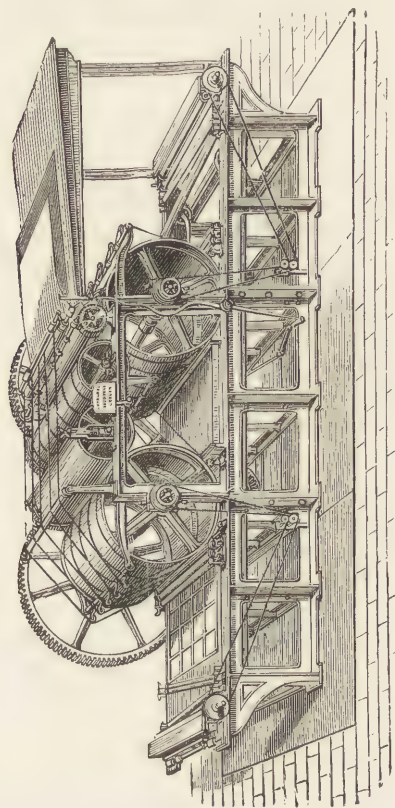
has been pressed upon the surface of the forme, which has been travelling on the reciprocating carriage underneath, attached to which is the distributing surface. Near the cylinder are three "forks," which hold the inking rollers, the spindles of which will be noticed protruding.

In the **Two-feeder Machines** the paper is fed in at two different places. There is but one cylinder, which, in its continual revolution, successively takes the sheets presented to it from as many points as there are feeding boards. There used to be four, six, eight, and even ten-feeder machines, but the web machines have rendered them obsolete.

In the **Two-colour Machines** there is but one cylinder, and the paper is fed in at only one feeding board. The frame of the machine is much longer than in single cylinder machines, the bed having to be long enough to carry two formes, and the travel is, of course, much longer. There are two sets of inking apparatus. The sheet is held fast to the cylinder by the grippers, in the same position as it was originally taken in, during the time it receives the impression of first one forme in one colour and then the second in another colour.

Perfecting Machines.—The *ordinary perfecting machine* was invented originally by Koenig; it resembles two single-cylinder machines placed with their cylinders towards each other. The sheet is led from one cylinder to the other by means of tapes. The track of the tapes resembles a horizontal . In the course of its track the sheet is turned over, and a different side presented to the second cylinder from that which encountered the first. At the first cylinder the sheet receives the impression from the first, and at the second cylinder it receives the impression from the second forme. In these machines, which were greatly improved by Applegath & Cowper, whose arrangements are in the main still adhered to, the impression cylinders are so large that only part of each is wanted to give the impression, and

as the rest of it must not be in contact with the forme as it revolves it is pared down to clear the forme on the return of the carriage, so that the cylinders are not true cylinders in



APPLEGATH & COWPER PERFECTING MACHINE.

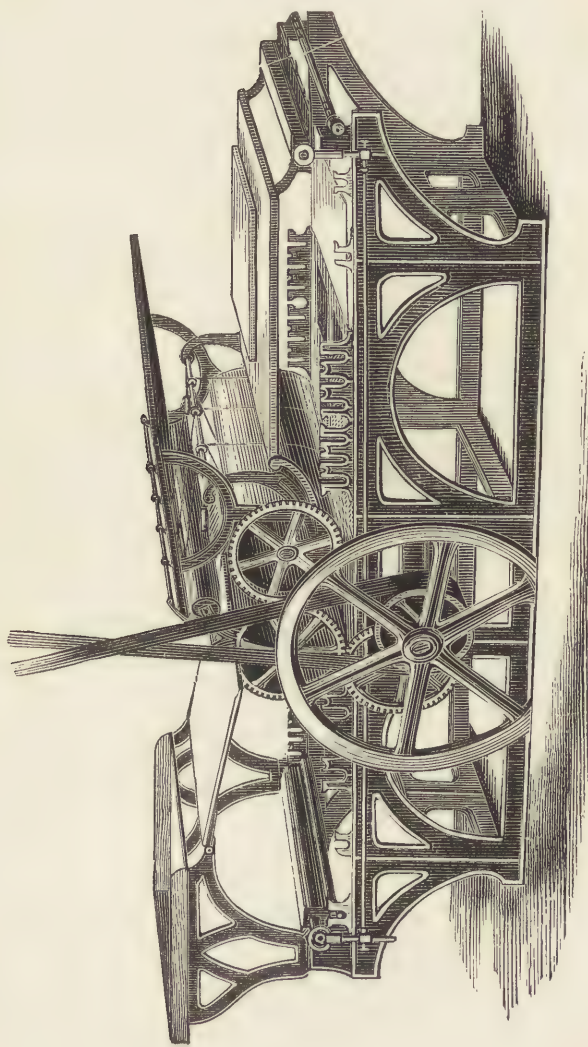
the mathematical sense. Between the two cylinders, and in order to regulate the track of the sheet, are two smaller drums, against which the tapes work, and these drums reverse the sheet, which is run out by tapes on to a taking-off

board between the two large cylinders. The small cylinders are also called register drums, because they regulate the time required for the transmission of the sheet from one cylinder to the other, as it is this which regulates the register. One of them is movable up and down by means of screws and bevelled wheels.

In another perfecting machine of this kind the intermediate drums are dispensed with, and the sheets are carried from one printing cylinder to the other by grippers. This machine, invented by Napier, was improved in France, and, when manufactured here with those improvements, received the name of "The Anglo-French Machine." It is familiarly known as a "Frenchman," and is now seldom made, though some of the principles of its construction are to be found in one of the modern small-cylinder perfecting machines made by Messrs. Payne & Sons, of Otley.

In it the cylinders are of comparatively small diameter, nearly the whole of their surfaces being utilised for the impression. It is necessary that one cylinder should be slightly raised on the return of the forme in order that the latter may not be impressed. Hence the cylinders are, in fact, on a level, but alternately rise and fall, which is one of the distinctive features of this machine. This movement is effected by a rocking frame, fitted with a knuckle joint, the upper portion of which is secured to the top of the side of the machine. When the joint inclines to an angle, the cylinder frame, assisted by springs, ascends; when perpendicular, the frame is forced down.

In the ordinary perfecting machines the sheet is printed as the bed runs in. In the Anglo-French this is reversed, and the sheet is printed as the bed travels to the end. The grippers of the latter first take the white paper and then release it to the outer forme cylinder, also supplied with grippers. Thence it is thrown upon the delivery board. One advantage of the Anglo-French machine is that the

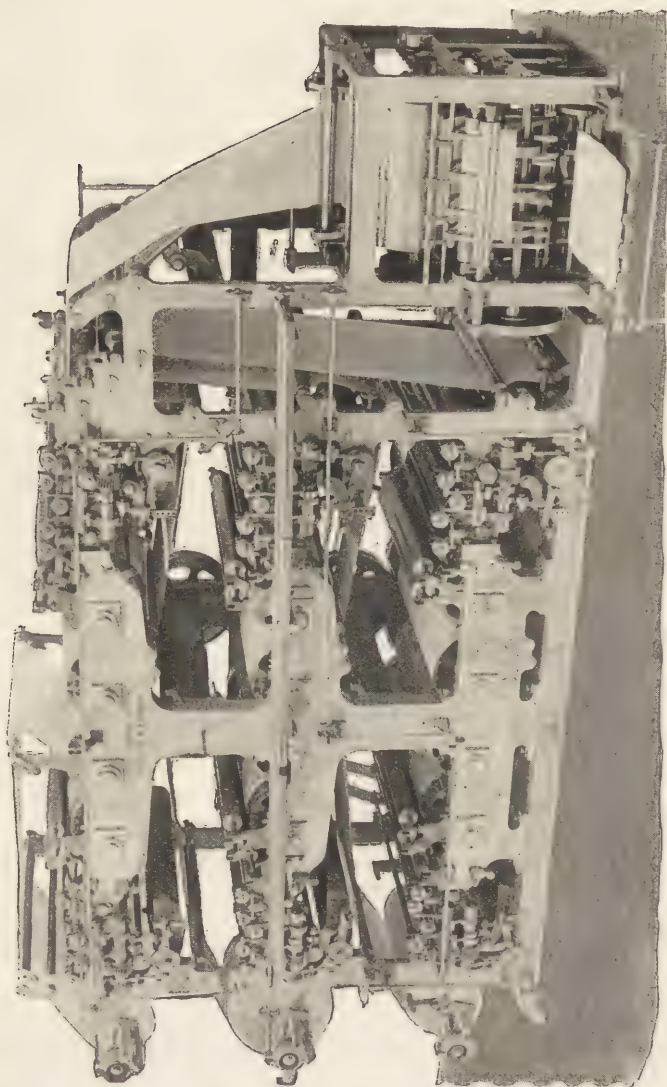


"ANGLO-FRENCH" PERFECTING MACHINE.

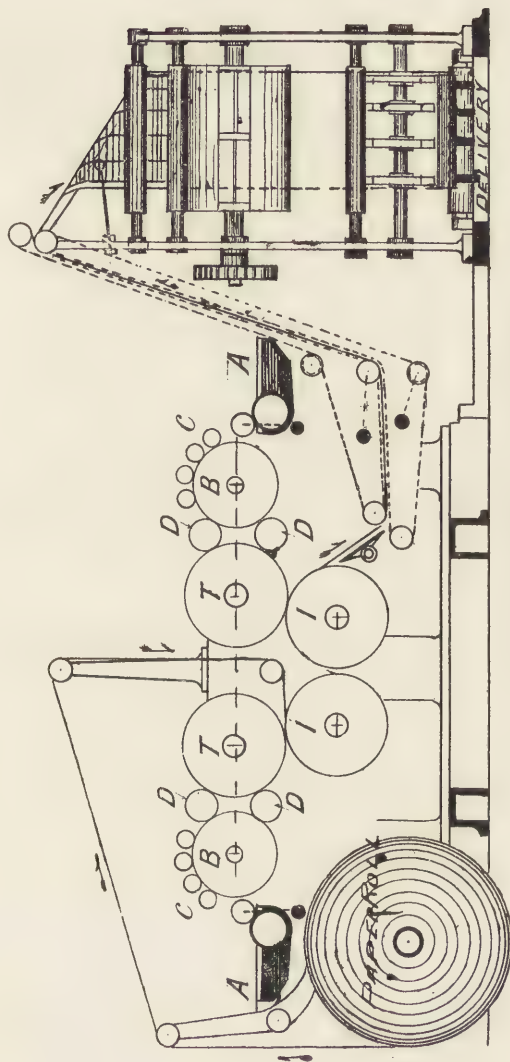
tables have a longer travel than the other machines, and the rolling is better, as the whole of the inkers, four in number, completely clear the forme. There is a set-off sheet apparatus, which is an arrangement for feeding in a sheet of paper, called the set-off sheet, with each sheet to be printed. This arrangement meets the sheet when it is entering on the second cylinder, and the set-off paper passing round with it prevents the wet ink on the printed side of the paper setting off on to the cylinder and from it to the following sheets.

The *Single-cylinder Perfecting Machine* (now seldom met with) is somewhat like the one-side cylinder machine, before illustrated, but the cylinder is double the usual size, and has two printing surfaces and a double set of grippers. Two sheets are printed at each revolution, the first being the white paper and the second being the partly printed sheet which has immediately preceded it. Near the crown of the cylinder is a small drum, which takes the sheet and reverses it; behind is another small taking-off cylinder carrying tapes, which delivers the sheet to a flyer. The sheet is, in fact, fed in as at an ordinary one-side cylinder machine; then it is taken off, reversed, again gripped, and perfected.

Rotary Web Machines.—Of these the best known are the "Walter Press," now obsolete, the "Victory," the "Marinoni," the "Foster," and the "Hoe" machines. The Hoe, which has received very many developments, may, in its simplest form, be here described, although it is possible to give only the most meagre account of its arrangements. *AA* are the ink ducts, *BB* the distributing drums, *CC* the two sets of wavers, and *DD* the inkers. There is a reel of paper placed on brackets at the end of the machine. The end of this roll is led over small rollers to the first impression cylinder *I*, when it is printed on one side by being pressed against the stereo plates on the first printing or plate cylinder *T*. It then passes to the second impression



A MODERN ROTARY NEWS MACHINE.



A SIMPLE FORM OF THE "HOE" ROTARY MACHINE.

cylinder, and the reverse or blank side is brought in contact with and printed by the stereo plates on the second plate cylinder *T*. The web, thus printed on both sides, runs along and travels up between tapes to the top of the folding apparatus, when by means of a series of knives and cylinders it is folded, and the newspapers are ready to be cut off and delivered at the bottom. The cutting is done by knives with serrated edges after the folding. The folded papers are deposited at a rate of about 12,000 per hour.¹ Provision is made in some machines for damping the paper before printing by a very fine spray thrown from small brass jets. In most large newspaper offices, however, damping is done by a separate machine, and the paper is afterwards re-reeled before going to the printing machine.

Motions of Cylinders.—As regards their motions the impression cylinders of printing machines are of three kinds:—

1. *The Stopping or Stop Cylinder.*—This performs a complete revolution and then stops, remaining stationary until the table returns; hence its name. The Wharfedale machines are the leading examples.

2. *The Rocking Cylinder*, or “Tumbler.”—This cylinder does not entirely revolve, but stops in its course, and then reverses its motion. It hence presents the appearance of “rocking.” Examples are to be found in the old Main machine, in all two-feeders, and in Dawson’s new “Perceler.” The advantage of the Tumbler over the Stopping Cylinder is the rapidity of which it is capable; the disadvantage is the fact that it is always in motion when the machine is running, and it is difficult to lay the sheets with great accuracy.

The Continuously Rotating Cylinder.—This constantly rotates, and is found in all “rotary” machines, as the

¹That is of an eight-page paper: of four-page papers the number is doubled, two being printed at a time. By doubling, quadrupling, and even octupling the machine enormous numbers can be turned out every minute,

"Victory," "Foster," "Hoe," "Walter," etc., and in the "two-revolution" single-side machines of which the "Miehle," "Century," "Cottrell," "Optimus," and other American machines are examples.

Feeding Arrangements. — In ordinary single-cylinder machines the paper is always taken in by grippers on the cylinder; sometimes it is fed to the top of the cylinder; but in most English machines it is received somewhere below the middle, and in this manner: Part of the cylinder is cut away, and within it is a bar, running parallel with the axis of the cylinder, and bearing the grippers; when the cylinder has completed its turn round, it stops in such a position that the grippers lie just below the level of the edge of the feed-board; the sheet is placed so that its foremost edge just touches the end of the feed-board; the board rises till the sheet touches the edge of the cylinder, when immediately the grippers close upon it, and the cylinder moves round, carrying the sheet with it and causing it to receive an impression from the type.

Perfecting machines with two cylinders have several kinds of feeding arrangements, and are called after them—the Dropbar, the Web, and the Gripper.

The *Drop-bar* is the simplest of any. Along a steel rod several round pieces of metal are arranged. They are movable along the length of the bar, so as to adapt them to the size of sheet to be fed in. The bar itself rotates by means of the tapes, and there is a contrivance whereby, when a sheet is presented, the bar drops slightly, thus squeezing the sheet by the discs already mentioned, and conveying it to the tapes, on which it is carried through the machine.

In a *Web* perfecting machine there is an arrangement of tapes whereby a sheet is laid down on them and carried forward. Very few of them now exist.

In a *Gripper* perfecting machine grippers are secured on

a bar inside a drum. The paper is stroked down to marks on the laying-on board, and the grippers take hold of the sheet. Gripper perfecting machines have superseded all the other kinds, as they admit of a greater accuracy of lay.

Pointing Apparatus.—In most good single-side cylinder machines there is a pointing apparatus for securing good register. Under the feed-board is a frame with two prominences or points, which can be moved to any position. These, when geared to the machine, rise after a sheet is fed in, and present the points above the level of the feed-board, which has gratings in it to enable them to appear. The holes made in the sheet by the spurs¹ at the first working are fixed on these points. Just before the sheet is gripped the points descend, and thus it passes into the machine exactly in the position desired.

Taking-off Arrangements.—In rotary, two-feeder, and perfecting machines the sheet is usually guided in its course by tapes until it reaches the place where it is to be received or “taken off.” Tapes, however, are liable to get out of order, and are therefore dispensed with whenever practicable; they cannot be omitted in the more complicated machines we have noticed, but in the single-side machines they are no longer found necessary.

Taking off the printed sheets used to be performed by hand, the operator, commonly a boy, being called a “taker-off.” Now, however, it is usually done mechanically by an apparatus called a “flyer.” That common to most of the ordinary single-cylinder machines consists of a wooden cylinder placed above and almost touching the impression cylinder, and fitted with grippers, which seize the edge of the sheet as soon as it is let go by the grippers on the impression cylinder, after having been printed on. By

¹ Spurs are iron points a little more than type high, affixed to the furniture of a forme. As the forme is impressed they perforate small holes in the sheet of paper.

revolving, this fly-cylinder draws the sheet over it from the impression cylinder, and then stops. At the next revolution of the machine the sheet descends on to a set of wooden fingers, which, having received it, turn with an oscillating fan-like motion, lay the sheet on the delivery board, printed side up, and then return to their former position, another sheet having by this time arrived ready for them. The reader will have no difficulty in distinguishing the flyer in the illustrations given on pp. 19 and 595.

Propulsion of the Table.—The table or carriage on all modern cylinder machines has a reciprocating or to-and-fro motion, bringing it successively under the impression cylinder and the inking rollers. This movement is effected in various ways.

In some perfecting machines there is an upright spindle and rack driven by a bevel wheel which is fixed at the end of the driving shaft. The rack is placed under the table, the cogs being downwards. The spindle revolves in fixed axes, and causes the rack to travel round it; for as the end is reached it moves to the other side. When the other end of the rack has been reached it again reverses its motion. In the same form of the Anglo-French machine, however, there is a horizontal rack with quadrants at each end. On the driving shaft is a universal joint with shaft and pinion wheel, which works in the rack and moves it. It is caused, at the end, to travel round a quadrant and underneath it till it reaches the other end.

Somewhat similar arrangements are to be found in certain of the high-class American single-cylinder one-side machines. In the Wharfedale machines there are two parallel toothed bars at the base. Over these work two traverse wheels, the cogs meeting the cogs on the bars and similar cogs on the underneath side of the table. The two wheels are connected by a rod with other two cog wheels, which are actuated by small cog wheels on the main shaft. As the

wheel to which the connecting rod is fastened revolves, it moves the two wheels between the rack backwards and forwards, and thus carries the table to and fro. This method is good enough for machines that are not very large, but when they are of quad crown and upwards the sudden change in the motion puts a considerable strain on the gearing and tends to make the machine not work so smoothly as is desirable. To lessen this defect air buffers are now added (see diagram on p. 718).

Inking Arrangements.—In all printing machines, as distinguished from hand presses, the inking of the formes is automatic.

We will now mention the various classes of cylinder machines and the kinds of work for which they are chiefly adapted.

Ordinary Cylinder Machines.—These, as we have seen, are the single-side stop-cylinder machines. There are three well-marked varieties—(1) the simple cylinder machines, light, quick-running, and cheap, such as the Ingle, the Standard (Ullmer's), and others; (2) the Fleet (Harrild's) and the ordinary Wharfedales (in which we include Bremner's), the latter being made by a number of firms in Otley, Leeds, Reddish, and elsewhere; and (3) the fine art Wharfedales or other fine art stopping cylinder machines.

For ordinary work up to a certain size, say double crown, there is not much to choose between the machines of the first category. Some of them are in sizes from foolscap folio to crown, and made to work by treadle, and for certain classes of job work they may be substituted for treadle platen machines. Their advantage over the latter kind is in point of price and size, but they take more space, and are not adapted to work with such good results.¹

Machines of the second kind are much dearer, have special arrangements for inking and register, are more solid, and are made

¹ An inexpensive foolscap folio and demy folio cylinder machine of novel construction has been brought out by Messrs. Powell under the name of the "Little Wonder." It works by treadle, and can be run at the high speed of 3,500 an hour.

with greater care and of better material in the working parts. They are necessarily more complicated.

Single-cylinder machines are made in the following sizes; the dimensions given are only approximate, as each maker has his own sizes:—

<i>To print sheets up to</i>				<i>To print sheets up to</i>			
		In.	In.			In.	In.
Foolscap Folio	-	-	10 × 13	Double Demy	-	-	24 × 36
Demy Folio	-	-	11 × 17	Double Royal	-	-	29 × 42
Foolscap	-	-	13 × 19	Quadruple Crown	-	-	30 × 40
Crown	-	-	16 × 21	Quad. Demy	-	-	36 × 48
Demy	-	-	18 × 24	Quad. Royal	-	-	42 × 58
Royal	-	-	20½ × 26	Quad. Double Crown	-	-	40 × 60
Double Crown	-	-	20 × 30	And even larger when required.			

To the ordinary commercial printer a double-demy Wharfedale is the most useful machine, if he can afford it. Demy 8vo is nearly as common a book size now as crown 8vo, while the great economy of imposing the sheet as half sixteens is manifest. Upon these machines may be done auction and contents bills, catalogues, table work, pamphlets, and general jobbing, down to almost the smallest sizes, although some of these are preferably put on a treadle machine.

One-side work may be well done on the cheaper machines, but whenever accurate register is required one of the better class machines is decidedly preferable.

The speed of a double demy is from 1,000 to 1,500 per hour; of a demy, 1,000 to 2,000.

Of the Wharfedales there is a superior class of machines called "colour machines." They are built more solidly, and have extra inking appliances.

The following are the chief "points" to be observed in the selection of a cylinder machine:—

General strength.

Simplicity of construction.

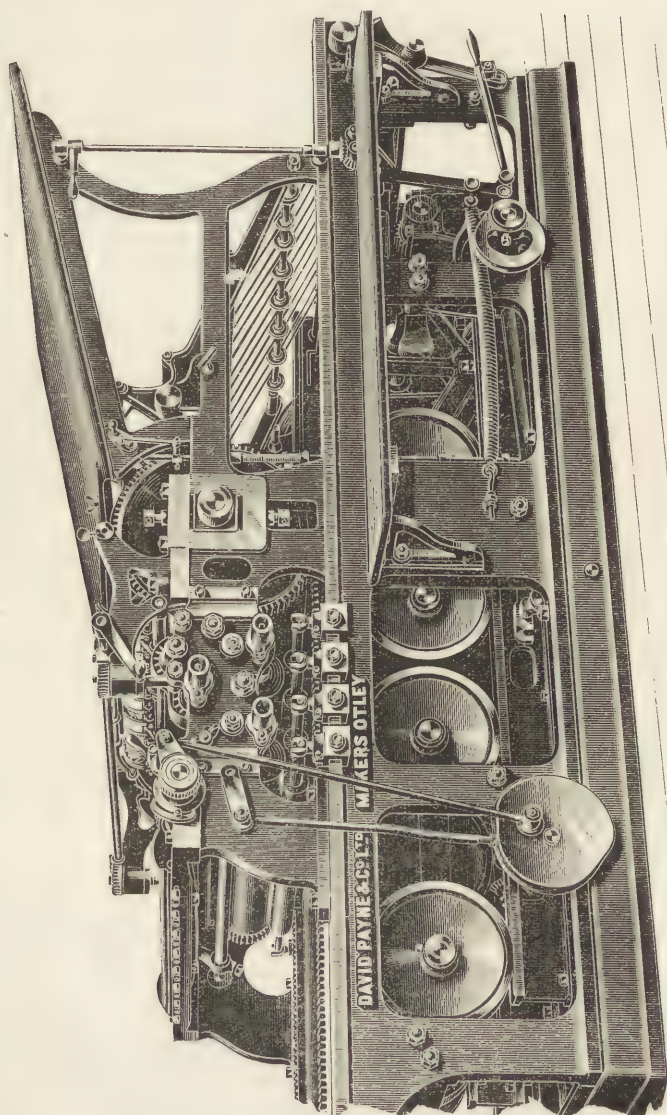
Lightness of running.

Speed.

Compactness.

Facility for making ready.

Sufficiency of rolling power. For first-rate work the inkers should be revolved by gearing, and riders should be added.



A FINE ART STOP-CYLINDER MACHINE.

The distribution of the ink should be adapted to the heaviest or the finest work. (If double inking is practised, the output of work will be reduced one-half).

A cylinder check, *i.e.*, an apparatus to prevent the cylinder from revolving when it should stop.

A reliable automatic taking-off apparatus, or "flyer."

The gearing and racks should be machine-cut.

The impression given should be even, clear, and sharp in every part.

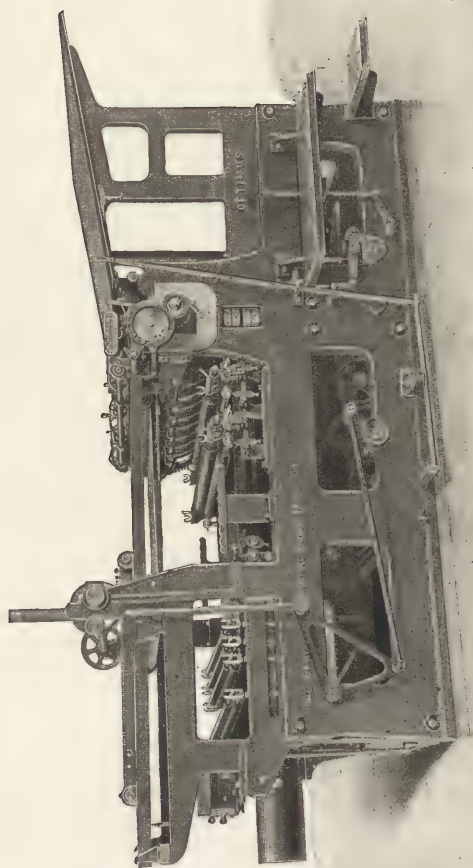
There should be a cylinder check for preventing the inking of the blanket when a sheet has missed.

Fine Art Machines differ from ordinary Wharfedales in that they are more rigid in construction and are fitted with extra distributing and inking arrangements, and various minor appliances which tend to the production of perfect printing. They are specially serviceable when half-tone or other process blocks have to be worked. Their cost is, however, very much more than that of the ordinary Wharfedales. Some of them are of German make; others, like those of David Payne & Co., Ltd., and Messrs. Furnival & Co., combine the best German principles with some of the English and American movements, but many of the high-class machines now in British printing offices are, we regret to say, either made in America or, as regards a few, like those of Messrs. Foster of Preston, are made here from American models. All these last are of the kind known as two-revolution machines.

Two-revolution Machines, so called because the cylinder keeps revolving and makes two complete turns for each impression, have a decided advantage in speed, being able to print 2,500 copies per hour of large sheets, if and when boys or men can be found to feed the machine at that rate. They also run more smoothly than the stopping-cylinder machines. In most of them, too, the flyer or taking-off apparatus is of a totally different kind from that on the ordinary Wharfedale, to which it is superior on account of its greater accuracy and infallibility. These machines are very costly.

Perfecting Machines.—The large drum gripper machines¹ are held to be superior to the Anglo-French, in that they may be driven at a high speed. They possess no intricate parts, and are simple in construction.

¹Now made with improvements by Dryden & Foord, Middleton & Co., W. Dawson & Sons, and Payne & Sons, and called after those makers.



A TWO-REVOLUTION MACHINE.

The advantage of perfecting machines is, primarily, that they complete the sheet before it is removed. This is most important in the case of periodicals, as perfect copies can be obtained as soon as the machine is started; whereas, with one-side machines, a certain number of copies have to be printed and removed, and the forme lifted, and another put on before a perfect copy is obtained.

For long runs of second-class work done on both sides perfecting machines are excellent, if economy has to be studied; but they will not turn out the highest class of work, which is now always done on single-side machines.

Two-feeder Machines are chiefly used for newspaper work. They give nearly double the number of impressions from a forme that a single-cylinder machine does. The points to be considered are: How many rollers go over the forme; whether the sheets deliver themselves print upwards; whether the working parts are easily accessible. They should give a perfectly flat impression and good register. The speed is also a matter of great importance.

Two-colour Machines are economical in offices where much of this kind of work is done, with long runs. They produce more work per hour than could be got out of an ordinary cylinder machine, by the use of which the formes have to be put on separately, and the sheets passed through twice. They secure proper register, and save spoilage, which frequently occurs when the paper has to be printed twice. They can also be used for one colour, although under the disadvantage of having only half the producing power.

Flyers.—There are various kinds of taking-off apparatus before the trade, each manufacturer claiming some feature of superiority. The flyer common to most stop single-cylinder machines is that described on p. 606.

CHAPTER LIII.

ROLLERS AND ROLLER COMPOSITION.—Various kinds of Composition—
How Rollers are made—Recasting—Recipes for Composition.

THE forms, nature, and characteristics of rollers having been stated on p. 568 it will not be necessary to repeat those statements here. We shall therefore say no more than that a roller is a spindle or cylinder of iron or wood, or iron cased with wood, called the roller stock, coated with composition, and proceed at once to the consideration of the composition.

Roller Compositions.—There are three kinds of roller composition: (1) One compounded wholly or chiefly of glue and treacle; (2) one in which glycerine is an essential ingredient; and (3) other compositions, some of which are composed of indiarubber. The two former are by far the most generally used.

The making of roller composition is now generally left to manufacturers who make a business of it; the printer buys it in cakes or slabs, melts it, and casts his rollers from it without going to the trouble of compounding it. The ingredients of bought compositions are not made public, while some of them are the subjects of patents.

The treacle and glue composition can usually be distinguished from the glycerine by its colour: the former being almost black, while the latter is a yellow brown. There is another and most important difference, too: the treacle and glue composition may be washed with water without injury

to the surface, while a composition consisting mainly of glycerine cannot be touched with water without its surface cracking. The printer has to bear this well in mind when managing his rollers.

The advantages possessed by compositions made chiefly of glycerine and glue are that rollers made of them will wear longer than those made of the treacle and glue (or old-fashioned) compositions, and that they are not so susceptible to changes of temperature. On the other hand, the old has qualities which make it take up and impart the ink in a manner the glycerine compositions find it hard to rival.

The points which should characterise a good composition, when applied to a roller, are :—

1. It should not shrink.
2. It should as far as possible resist becoming hard in cold weather and soft in hot weather.
3. It should possess and retain a clinging, sucker-like surface; this quality is called its "tack" or "lug."
4. It should preserve a good, even surface or "face," and never part with any of its substance to the ink or the forme.
5. It should require washing very seldom.
6. It should be capable of remelting.
7. It should be tough and durable, and stand wear and tear.
8. It should take up ink readily, and give it off freely and without waste.

How Rollers are Made.—Rollers are cast in moulds. These moulds are of two kinds: (1) open or *split* roller moulds, and (2) *tubular* ones; but the former are now seldom used, owing to the fact that rollers cast in such moulds generally have a seam projecting from their surface corresponding to the part where the two sections of the mould come together.

Tubular Moulds consist simply of cast-iron or brass tubes, perfectly true and polished on the inside. They should be proportioned to the size of the roller to be cast. A mould, for instance, for a press roller 18 inches long should be about $\frac{5}{8}$ of an inch thick and 3 inches diameter. Cast-iron tubes, bored out by machinery, are the best for all purposes; but brass tubes are sometimes used for small, short rollers, being cheaper than the iron ones.



The making of rollers is an important business pursued by several firms in London and other large towns. Such firms will contract with printers to supply them with rollers and change them when needed for certain annual sums. In small towns and country offices the printer often has to cast his own rollers, and this is

how he should do it:—

The composition is supplied in slabs. These are cut up into small pieces and put into a melting kettle, which is simply a pot, with a lid, and a spout for pouring, standing in another pot in which cold water is placed.¹ This is heated by placing it over a slow fire, or, better, by means of gas, and as the kettle gets hot the composition melts. It should be stirred occasionally with a stick, and *never* allowed to boil.

While the composition is melting, the mould is prepared to receive it. In the first place, the interior is well wiped, to get out all dirt. The mould is then warmed till you can

¹ For casting a small roller a melting kettle may be dispensed with. The composition can be placed in a large jug, and this may be placed in a saucepan, with just sufficient water to reach half-way up. This will almost do as well as a proper kettle, but an old plate or something of the kind should be put under the jug, lest it should crack through coming in contact with the hot bottom of the saucepan.

just bear your hand on it. Then it is carefully oiled all over inside, by means of a mop made for the purpose. This oiling is best done with sperm oil, and its object is to prevent the composition from sticking to the mould; for should it do so in any place the roller will be spoiled. Then the stock (heated if entirely of iron) is put in its place down the centre of the mould, and the end piece is put in at the top to keep it in position. When the composition is quite melted, and any air in it has come to the surface, it is slowly poured into the mould from the kettle by means of the spout, and care must be taken to pour it on to the stock and not on the side of the mould (which would remove the oil from it), and also to let it run down one side of the stock, leaving the other side free for the air to escape up; for should it not escape there will be air holes in the roller, and these will spoil it. The composition should be filled up to at least an inch more than the length of the roller required, to allow for shrinkage, and the mould must then be permitted to cool. This will take some hours—about ten on an average. The roller has now to be carefully withdrawn. To do this properly the end pieces are removed and also the base, and one man pulls the stock while another pulls the mould; no jerking or rough usage is permissible, but the roller may sometimes be pushed as well as pulled. If the mould is not too thin, and has been properly oiled, the removal should present no difficulties, except perhaps in the case of very long rollers. It is for the casting of these that the split moulds are by some considered preferable, for they have only to be opened, and the roller to be taken out. Rollers can be removed best before they are quite cold.

When the stock is an iron spindle, uncoated with wood, it is usual before placing it in the mould to tie round it tightly pieces of string or tape at intervals of about an inch, or to coat it with lead paint or flatting. This is to prevent the composition from coming off. If a stock has had a

roller upon it before, the old composition must be stripped off with a knife, and the surface scraped. Water must be kept away from it, and also the hands, if they are damp with perspiration.

It is extremely important that the stock should be perfectly straight, and that it should be placed in the centre of the mould, so that it may form the true axis of the roller, otherwise it will never work well.

After the roller is taken out of the mould, the composition extending over the ends of the stock must be cut off. This is best done by encircling the end with a piece of thin cord or fine wire, and pulling each end of the cord or wire till the composition is cut through. This done, the ends should be trimmed with a sharp knife, making them bevelled towards the core. Then a hot iron should be run around the ends of the composition, thus soldering it to the stock.

When the roller is cast and trimmed, it should be put away for a few days, though in case of need it may be used after a lapse of twelve or fourteen hours. Every printing office ought to contain a roller cupboard, in which all kinds of rollers may be kept protected from sudden vicissitudes of temperature, as well as from dust floating in the air. The roller composition should not be allowed to come into contact with any substance whatever, and press rollers should be supported on bars running through the cores or stocks. The roller cupboard should be of the same temperature as the pressroom, hence it is best when the cupboard is fixed there. Sudden changes of temperature, as from a cold cellar to a warm pressroom, will soon injure rollers, and prevent them working a proper length of time. Air should be admitted to the rollers through small holes in the cupboard, otherwise they may suffer from mildew.

The mode of ascertaining whether a roller is ready for use is this: It should be moderately soft to the touch, yet perfectly elastic and strong in texture. Grasp it gently with

the hand, or pass the ends of the fingers along its surface lengthwise. If it is in a raw, sticky condition, it must not be used; it is then said to be "green." If it appears only moderately adhesive and pliant, but uniformly so, escaping from the fingers without showing an indentation from them, and with a smooth rebound, it is in proper condition for working. Rollers gradually harden as they get older, and, in time, they become so leatherlike as to be useless. They must then be recast.

Do not wash a roller when it is taken from the mould; it will be all the better for two or three days' seasoning with the oil on the surface.

It is always good economy to have sufficient rollers cast in advance, so as not to be obliged to use new ones until they are properly seasoned.

If it can be helped, rollers should not be made in very hot or very cold weather; they are at all times much affected by temperature.

Good rollers cannot be cast except in perfect moulds.

The moulds ought always to be kept perfectly clean and free from rust, and not a speck of dirt or fluff should be in them when they are about to receive the composition.

The management of rollers is one of the most important parts of the craft of the pressman and machine-minder. A chapter upon this subject will be given later on.

Recasting Old Rollers.—The old roller should be first of all thoroughly washed, and the surface, if hard, scraped with a knife. Then draw, or drag, the composition off the stock and cut it up into small pieces. If the roller has been used only a short time, the composition may be melted almost as readily as new composition; if it is older and not of the glycerine kind, put it in a sieve and soak it in cold water for about fifteen or twenty minutes. Take it out of the water, cover it with a damp cloth, and leave it over-night. It is then ready for being melted in the usual manner.

Generally, not more than one-fourth of the old stuff may be added to the new; but this does not apply to the special preparations of

composition, which are to be treated according to the particular directions of their makers.

All composition becomes deteriorated by frequent meltings. If the roller be too hard, more syrup and a little less glue may be added to the old; if too soft, a little more glue may be all that is necessary.

Surplus composition should always be poured into pans for future use, and when required should be melted by itself.

Boiling glue and treacle together too much is apt to take away the useful properties of both. The treacle candies, and the glue becomes dry and leathery.

When composition becomes rough and stringy from too much boiling, the addition of a little treacle will generally reduce it sufficiently to pour well into the mould.

The Making of Roller Compositions.—Though roller composition, like ink, is best bought ready made, and is usually so obtained, it is well that the printer should know how to make it in case of need. There are many recipes, but the three following will be quite sufficient:—

Recipe No. 1.—Glue, 8 parts¹; treacle, 12 parts; Paris white, 1 part. Break the glue into small pieces, and steep it in water until it bends easily without cracking it; the water should then be drained off, and the glue left till it gets thoroughly softened, when it should be put into the melting pot and stirred occasionally till it is dissolved. Should any hard pieces remain, they should be taken out. When the glue is thoroughly melted, the treacle should be put in and stirred until it is well heated and mixed with the glue, then the Paris white should be stirred in. The composition may be used at once for casting a roller, or poured into pans to form slabs.

Recipe No. 2.—Glue, 4 parts, say 4 lb.; treacle, 8 parts, say 8 lb.; isinglass, 1-10th part, say 1½ oz.; spirits of turpentine, 1-32nd part, say ½ oz. Treat the glue and the treacle in the same way as in Recipe No. 1. Dissolve the isinglass in as much water as is required for the purpose—that is, not quite so much as will cover it. Then add it to the glue and treacle, and afterwards put in the turpentine. Boil for fully an hour.

If the office be damp, 6 lb. of treacle will be sufficient to 5 lb. of glue.

¹ *I.e.*, parts by weight, whether the unit be the pound or any multiple or aliquot part thereof; thus, if the pound be the unit, there will be 8 lb. of glue to 12 lb. of treacle, and 1 lb. of Paris white, and so on in the other recipes.

To *recast* old rollers thus made, add to the old composition, when melted, 2 lb. treacle, $\frac{1}{2}$ lb. glue, and $\frac{1}{2}$ oz. of isinglass, after which boil, as before, fully an hour.

Recipe No. 3.—Glue, 10 parts; sugar, 10 parts; glycerine, 12 parts. The sugar should be refined, but not sharply granulated. Treat the glue as before; melt; add the glycerine and sugar, and boil until the water is as nearly out as possible. The core (or stock) and mould, when used for the casting of a roller, must be hot.

Much depends, in any recipe, on the quality of the *glue*. It should be clear and bright in body, and even in texture, when held up to the light. It should break short, but only after considerable force is used, and with a clear sharp edge, like glass. Spotted and cloudy glue should be refused.

If the weather be hot, more glue and less sugar matter or glycerine may be required; if cold, *vice versa*.

CHAPTER LIV.

INK—What it is composed of—Necessary Qualities—Black Inks—
Coloured Inks—Adaptation to Paper, Speed, Type, and Tem-
perature—the Keeping of Inks—their Manufacture.

Printing Ink.—The general nature and properties of printing ink were stated in Chapter II. We will now examine this important substance closer.

Its Composition.—Printing ink is a compound of varnish and colouring matter. It is generally procured ready made in cans or drums; though for colour work some printers prefer to buy the varnish and dry colours separately, and to make their own ink.

Necessary Qualities.—Printing ink must possess many peculiar properties. It must be of a mutable character—that is, it must change from the soft adhesive state in which it is applied to the type to that of a perfectly hard and dry substance after being deposited on or transferred to the paper. This change of condition must have a certain rate of progress, and be to some extent under control. When manufactured, some time generally elapses before it is used, and during this period it should not alter in the slightest degree. In fact, when the air is excluded from it, it should keep for any length of time. During its application to the type, its solidification should be as slow as possible, and unaccompanied by the emission of any unpleasant or deleterious odour. It ought not to affect the rollers, or injure their softness and elasticity. The change of state should not be accompanied by the deposition of consolidated matter in the ink, as this impedes the pressman and proves a loss to the printer. Printing
(622)

ink should, moreover, have a kind of oleaginous character ; it ought to be very glossy, and perfectly free from any granular appearance. If, on the extraction of a small portion from a mass, it leaves but a short thread suspended, it is considered good. The best test of its consistency is the adhesion it shows upon pressing the finger against a quantity of it. The requirements of a good printing ink do not end here. Having been applied, its action must be confined to a very slight penetration into the paper—just sufficient to prevent its detachment without materially injuring the surface of the latter. It ought to dry up in a very short space of time into a hard, inodorous, unalterable solid.

In addition, the ink must be such that it will not dry on the rollers, but will maintain them in good order, preserving their adhesiveness : it must distribute freely, work sharp and clear, wash easily off the type, dry rapidly on paper, keep the ink table clean and free from specks, and not fill up the forme. The colour, too, must be permanent, without a tendency to change with age.

Black Ink.—The ingredients of ordinary black printing ink are (1) a varnish, made generally from linseed oil and resin, and (2) lampblack more or less fine, the brownish tone of which is often corrected by the addition of a little indigo or Prussian blue.

Coloured Inks.—The body of these is again varnish, more or less stiff, and more or less clear. The colour is imparted by the addition of dry colours ground to an impalpable powder. Full instructions in the preparation of these inks in small quantities will be found in the chapters on Colour Printing in Vol. II. of this work.

All inks must have their ingredients most thoroughly mixed by being passed more than once through a mill composed of steel, or preferably marble, rollers working one against the other. For the production of small quantities a marble slab and a marble muller may be substituted for the mill.

Adaptation of Inks to the Work required.—It is of the greatest importance that the printer should know the distinguishing qualities of various grades of ink, and the kinds of work for which they are best adapted. The qualities made are many. Some are for slow machines or hand presses; others are for machines of medium speed, running from 800 to 1,000 per hour; others for very fast machines, up to 20,000 an hour. Then there are qualities suited for ordinary, fine, and finest bookwork and jobbing, for cuts, and for process blocks. It is only experience that can guide the printer in making a selection. Price is also sometimes a consideration.

Then, too, the nature and stiffness of the ink to be used are largely determined by the nature and quality of the paper to be used. It is false economy to buy cheap inks simply because they are cheap: indeed, the best inks are generally cheapest, if a printer takes into consideration the fact that each time he issues a job he is sending broadcast an advertisement which will be quickly noticed as being good or bad. Besides, the better inks frequently do so much more work as to pay the difference in the cost.

It may be said in general, that newspapers require an ink of less substance than that required for bookwork, which must be tolerably stiff. For half-tone blocks the ink must not only be very stiff, but very finely ground. The qualities of the material to which the ink is applied furnish an additional guide in this matter; thin paper must have a soft ink, which works clearly and is not too adhesive. Wetted paper needs a thinner ink than dry paper. A fine, stout paper, with a calendered or a surfaced face, wants a stiff, glutinous, and quick-drying ink; and as resin supplies these properties, so does it in a great measure communicate brilliancy, and the most perfect and splendid effects are by these means produced.

Posters, with large wood types, require a semi-fluid ink,

but not one surcharged with oil. Ordinary newswork requires a better quality, more tacky and finely ground. Good bookwork should have a stiffer-bodied ink—soft, smooth, and easily distributed. Ink which is made expressly for presswork on dry paper should be used only for dry work, and *vice versâ*; ink for wet paper will not work well on dry paper. Very fine presswork, such as process blocks, woodcuts, or letterpress upon “art” or enamelled paper, requires an ink impalpably fine, of brilliant colour, of strong body, yet soft and velvety enough to be taken up smoothly on the inking rollers.

Stiff inks require more distributing power in the machines. Platens, rotaries, and perfecting machines have usually very little distributing power, and require thin inks. The high-class Wharfedales, the Hoe, Miehle, and other two-revolution machines have good distributing power and can take any class of ink.

Old and firm rollers are best for stiff inks, for new and soft rollers would be torn from their stocks if used with it. Patent rollers, such as the “Durable,” are generally the best for any kind of ink.

Heat and cold have marked effects upon printing inks. The former renders them thin and free in working, the latter hard and stiff. In very hot weather dryers have sometimes to be added, while in cold weather it is necessary to thin the ink, generally by putting lighted candles or gas jets under the table so as to get the ink and rollers into working order. In most offices provision is made for thus heating the ink table when occasion requires. But some experienced pressmen deem this mode objectionable and prefer reducing the ink in cold weather by boiled oil.

It is very important to use an ink adapted to the quality and colour of the paper to be printed. On this subject Messrs. Fleming & Co. give the following hints for selecting ink:—

"Notice whether the paper is white or brownish ; a brown tint in paper makes ink look brown.

"Notice if the paper is porous or glazed. If you press your tongue against it, it will, when porous, immediately get soft from absorbing the moisture, and become semi-transparent. Porous paper is, of course, less transparent, and with a stiff ink is more apt to be torn ; it requires, therefore, thinner ink, and is generally printed upon in a damp state.

"Soft paper generally contains clay—sometimes as much as from 30 to 40 per cent.—which makes the paper brittle, and the powder is apt to fall off and make fluff on the machine, ink table, and rollers. The ink is then often accused of being unground, from this sticking to it and making it look rough and sandy.¹

"Soft or engine-sized paper, from its absorbent nature, takes up ink rapidly, as in newspaper printing, where the impression is intended for immediate sale ; while in the case of tub-sized paper (which resists the action of the tongue before mentioned) dryer inks, specially prepared, require to be used, as the ink is not absorbed, and must therefore form a skin, in order not to set off. Quick-drying inks, such as bronze blue, for instance, require to be cleaned up from type, tables, and rollers each time the machinery stands, as a skin is apt to form, which may either tear the rollers or come off in little pellets, filling up the type."

Coloured inks of great intensity can now be procured, but even these will not with one printing produce some of the very brilliant effects of which American printers are so proud. The only way to obtain these results satisfactorily is to give what is equivalent to two coats of paint—to print the work twice.

When working on enamelled paper or cards it will be

¹ See page 638 for test for clay in paper.

found advantageous to mix with the ink a little soap or the white of an egg. Copal varnish and tallow are also recommended.

A little bronze blue mixed with black ink will make it appear blacker, especially if it has to be worked on a dirty white or a brown paper.

Drying after Printing.—In drying after printing the oil or varnish in the ink becomes hard by mixing with the oxygen of the air, the pigment being thereby imprisoned, and prevented from rubbing off or smearing.

When a job is wanted to be packed in a hurry, French chalk, or better, very fine powdered magnesia, dusted over fresh printed work will dry it without destroying the colour.

The Keeping of Inks.—Inks are sent out from the makers in cans and drums with tight-fitting lids, and these lids should always be replaced as soon as possible after the can is opened; for otherwise a hard skin will be formed and dirt and dust will get in, and these are detrimental not only to the ink itself, but to the work to be done with it, and sometimes also to the faces of type and cuts.

Ink cans should be kept in cupboards wherever practicable.

When a can of ink has been standing for some time, it is well to turn the contents out and mix them well with the ink slice or palette knife.

When a new can is opened, the ink—especially if thick or quick drying—should be lifted from the top, keeping the surface as smooth as possible, otherwise the side portions skin, and are apt to mix with the rest of the ink, spoiling the whole. All scrapings from tables and ducts should be kept separate for poster or coarse work. If water gets mixed with ink, it will make it roll out badly and work specky. Any skin formed should always be carefully removed.

If it is necessary to keep coloured inks, the best way

of preserving them, so that they shall be workable after standing some time, is to pour a little glycerine on the top and securely close the vessels containing them. This will not rob the ink of any of its colour. Some colours will not keep at all, and others deposit at the bottom of the can almost all their solid ingredients.

Red and some other coloured inks are often found to become so hard in a few weeks after the can has been opened that the knife can scarcely be got into them, and they cannot be got to work at all. Oil, varnish, and turpentine are of no use in such a case; the remedy is paraffin oil mixed well up with the old ink.

Inks too Thick or too Thin.—When ink is put out for a job, the pressman must consider not only whether it is the right shade, but whether it is too stiff or heavy, or too thin and liable to spread on the impression. Varnishes are of three grades: strong or “long,” middle, and thin, and every office should be provided with at least two kinds, of which thin must be one, as well as well-boiled oil. If the ink, from the effects of cold or any other cause, is too heavy to distribute freely even after warming the table as above described, which should always be tried first, add the varnish or oil—the varnish for fine, the oil for ordinary work—in small quantities, and mix well until the ink is reduced to a proper consistency for distribution, without making it so thin as to deaden the colour or cause it to spread. Many prefer paraffin oil rather than boiled oil or turps for thinning down both black and coloured inks.

If a thin, cheap ink is being used, and it is found to be too thin for the work in hand, a small quantity of a better quality of ink may generally be mixed with it to give the necessary body to produce a clean impression.

Dryers.—Besides the above matters, the pressman must consider whether his ink will dry fast enough, or will dry too fast. Every printer should have a good drying preparation,

which he may buy of the ink makers. Balsam of copaiba makes a good dryer: so do acetate of lead and borate of manganese; these should be in the form of perfectly dry, impalpable powder, and should be rubbed into the ink in a mortar. In using a dryer the pressman must exercise his judgment in regard to the extent to which the ink should be mixed with it, as no rule can be given to suit all contingencies which may arise where such dryers are necessary.

Gloss.—A hardening gloss for inks may be made by dissolving gum arabic in alcohol or a weak solution of oxalic acid.

This mixture should be used in small quantities, and mixed with the ink while it is being consumed.

The Manufacture of Inks.—The way printing inks are made is substantially as follows, though each factory has its own methods:—

The best quality of linseed oil is used in superior inks, and this is purified by digesting it in partially diluted sulphuric acid for some hours, at a temperature of about 212° , allowing the impurities to subside, and then washing away the acid with repeated additions of hot water. The oil, after this treatment, is pale and turbid, and if the freeing from the acid is complete there is scarcely any odour. By rest the oil clarifies, and has then a pale lemon colour. It now dries much more rapidly than before. The purified oil is now partially resinified by heat. For this purpose it is introduced into large cast-iron pots and boiled until inflammable vapours are freely evolved. These are ignited and allowed to burn for a few minutes, after which they are extinguished by placing a tight cover over the boiler. Ebullition of the oil is continued until, on cooling, a firm skin forms on its surface; this is found by placing a drop on a slate or other smooth cold surface.

Other drying oils besides linseed are occasionally used, *e.g.*, resin oil and paraffin oil, but both cause the ink to smell badly. Resin is an article of considerable importance in the manufacture of printing ink, since, when dissolved in the oil after the latter has undergone ebullition and inflammation, it communicates body to the fluid. For many inks the quality of the common black resin is sufficiently

good, but some require the pale, clear, transparent resin, obtained by melting and clarifying.

In one of the most common systems of manufacturing printing ink the resin is dissolved in the burnt oil in cast-iron pots or boilers, and the varnish thus prepared is introduced into what is termed the mixing vessel, which is cylindrical, and in the centre of which bars or rods of iron, attached to a perpendicular shaft, revolve in a horizontal position. The colouring matter is then added to the hot varnish, and the whole, when thoroughly mixed, is drawn off through an opening in the base of the vessel. The pulp is next very carefully ground, by being passed between hard stones of a very fine texture, driven by heavy machinery, care being taken that the varnish of resin and oil is clear and free from gritty particles, and that the black is in an impalpable state. The proportions and conditions of different ingredients vary considerably, and great experience is required before an ink can be prepared to suit any one purpose. The oil has to be rendered more viscid, by burning, in some cases than in others; sometimes the quantity or kind of resin requires to be varied; or, perhaps, different proportions of colour are requisite.

Recipes for making small quantities of black and coloured inks will be found later in one of the chapters relating to Colour Printing.

CHAPTER LV.

PAPER.—Different Kinds—How Viewed by Pressmen—Substance, Quality, and Surface—How Paper is Made—Various Materials for Papermaking—Tests—Kinds of Paper—Technical Terms—How Paper is Sold—When used Dry and when Wet—Wetting.

THOUGH on rare occasions a printer has to take impressions on parchment, vellum, satin, and one or two other substances, in practice his art is restricted to printing on paper and card.

These substances were referred to in the part of the book relating to Composition (pp. 21 to 38), and were then dealt with from the compositor's points of view, which are that of size or dimensions, and that of surface so far as concerns the choice of types for jobbing work. The pressman has to consider them in point of size also, but there are other aspects which are to him quite as important, if not more so—namely, substance, quality, and surface.

As regards size of sheet, we need say simply that the pressman considers this when deciding upon the size of the press or machine upon which the job is to be worked off; it is obviously of no use to select too small a press, and on the other hand there is waste of power and want of economy if one too large is chosen, when a smaller one is available and will do equally well.

As regards substance and quality, some papers are thin, others stout; some are soft, others hard. Of so-called white papers, some (the best) approach in colour to whiteness, while others fall away from it in varying shades of grey, or

yellow, or brown. All these matters have to be considered when the kind of ink is selected.

The most important matter, however, so far as the pressman is concerned, is the surface—whether it is hard or soft, rough or smooth, plain or enamelled; because according as the surface is so will he choose his mode of printing and select the nature and quality of his inks and rollers.

Paper: How Made.—It is very desirable that a pressman should have at least a general knowledge of the modes of manufacture of paper and of the substances which compose it. We will therefore proceed to give a very slight outline of the processes of paper making.

The original, and still the best, material for paper making is linen or cotton rags; but, as there is not a sufficient supply of them, many other substances have been used, *e.g.*, silk waste, raw cotton, bamboo and other rushes, straw, esparto and other grasses, and wood. The essentials in the material are fibres which can be broken up easily, and which when pulped entirely lose their elasticity, regaining it when dry again in the form of paper.

The chief materials for paper making are (1) rags, (2) esparto grass, (3) wood. Rags are used for good writing and printing papers; esparto and wood for the inferior sorts of printing paper. Paper made from a mixture of esparto and wood is used mainly for the better newspapers, while that made from wood alone is adopted for the cheapest periodicals. The best paper is made from linen, while a mixture of rags and esparto gives a very good result.

There are two main divisions in the manufacture: (1) The conversion of the rags or other material into pulp, and (2) the conversion of the pulp into paper.

The Making of the Pulp.—The rags are sorted into qualities, cut up into pieces about as large as the palm of the hand, and passed into a “dusting machine,” which knocks off all loose dust and delivers them over to a boiler. This

boiler is a large cauldron with a false bottom, on which the rags rest, and there they are boiled continuously in a solution of caustic soda for ten or twelve hours. They are then removed, freed from any existing foreign matter, and put into a "breaking engine," when they are beaten up into pulp. The pulp is then bleached, generally with chloride of lime; it is afterwards drained and beaten up in a "beating engine," with constant supplies of fresh water, until all traces of the chloride of lime are removed. While in this engine it receives such "loading" as is given to it, *e.g.*, china clay, pearl white, etc. After this it is sized with a mixture of resin, soap, and alum, starch being sometimes added; then the colouring matter is put in, and this varies according to the hue or tone desired, but even white papers require some colouring matter, the kinds used for them being cochineal or magenta, or ultramarine or aniline blue.

The pulp is now ready to be made into paper, and it is put in the pulp chest and strained.

Esparto grass is received at the mill already sorted, all roots and weeds being removed; it is then put through the same processes as rags, commencing with the dusting machine. When in the boiler, however, the solution of caustic soda must be stronger than that required for rags, and in bleaching an extra quantity of chloride of lime is necessary.

Straw is often mixed with esparto for commoner papers; and is sometimes used alone, but it will not make serviceable paper, because it is too brittle.

Wood pulp is procured either mechanically or chemically. In the mechanical process, blocks of wood (generally pine or poplar) are ground by stones under water, to a powder, which floats away and is afterwards collected and pressed into sheets, and then dried. It is received at the mill in this condition from Norway and Sweden, and here it undergoes a treatment similar to esparto; in the chemical

process—or processes, for there are several—the wood is acted upon by various chemical re-agents, in order to obtain a pulp. Some of the successful processes of making paper from wood are patented. Paper from wood pulp, chemically prepared, is sometimes excellent; that from the mechanically prepared pulp is deficient in colour and rotten. None but very cheap ephemeral works should be printed on it, such as halfpenny newspapers.

The Conversion of the Pulp into Paper.—This is done either by the hand process or by the paper-making machine. The former is used now only for the very high-class papers called “hand-made,” their chief merit over the machine-made papers being superiority of toughness and durability. Hand-made papers are only made from good rags.

The Hand Process.—The pulp being placed in a “chest” and strained, it passes into a vat. The paper maker takes up his mould, which consists of a sheet of very close-meshed wire cloth, with a movable frame or “deckle” all round it to hold in the pulp. This mould he dips into the vat, and takes up enough pulp to make a sheet, a long experience teaching him the quantity to take each time, and so wonderfully exact is this done, that the sheets when dried only differ in weight to the extent of 3 or 4 grains; he tilts the mould first one way and then another, to cover the wire cloth evenly with the pulp, and then gives the mould a shake which makes the water pass through the meshes and settles the layer of pulp on the wire cloth. The mould or frame is then reversed upon a piece of felt or woollen cloth like a blanket, another piece of felt is laid on it, and the process is repeated. When there is a sufficient number of sheets the pile is taken away and pressed, each sheet being sandwiched between the felts. Afterwards the sheets are hung to dry on ropes made of cow-hair; and after that they are sized, and then pressed between sets of rollers, when they become perfect paper.

The Machine Process.—The paper-making machine was invented by a Frenchman about a hundred years ago, and was introduced into England by Fourdrinier. It has since received many important improvements. It is a very long apparatus, and the parts of it are so arranged that pulp being put in at one end, perfect paper comes out at the other. Apart from the mould and the apparatus connected therewith, the machine consists mainly of series of rollers placed transversely, between which the film passes successively until it is perfected. The principle of the machine is very simple; it has, at its extreme end, a shallow receptacle for holding the pulp, which by now has become so perfect as to be simply "liquid paper." This receptacle or tray is gradually supplied from a great pulp-vat, in the centre of which a "hog" or wheel continually turns, thus keeping the pulp fibres constantly agitated. The receptacle even has a rocking motion, and the pulp passes from this with mathematical regularity over the wire-gauze mould, which, instead of being in single squares, as in the hand process, is an endless sheet moving round two rollers, which keep it stretched out and revolving when in operation. Under the part which receives the pulp there is a series of small brass rollers. These, being nearly close together, keep it perfectly level—a most necessary condition; besides which there is a shallow trough, called the "save all," which catches and retains the water that always escapes with some pulp in suspension; and an arrangement of suction boxes and tubes, worked by air pumps, which draw much of the water out as the pulp passes over them. The pulp is kept from running over the sides by straps, called deckles, which are also endless bands, usually of vulcanised india-rubber, carried round moving rollers, so that they travel with the wire gauze, and therefore offer no resistance to it. In addition to all this, the framework on which the surface of the wire gauze rests has a "shoggling"

motion, or side shake, which has an important effect in working the fibres together before the pulp finally settles down. When it reaches the "couching rolls," which press out most of the remaining moisture, and carry it forward to the first and second series of "press-rolls" by means of an endless web of felt, which passes round them, the speed of these rollers and the travelling sheet of felt is nicely calculated, so as to prevent a strain upon the still very tender web of paper. Sometimes the upper rollers of these two series are filled with steam in order to commence drying the web. The paper is now trusted to itself, and passes on from the second press-rolls to the first set of "drying cylinders," where it again meets with a felt sheet, which keeps it in close contact with the drying cylinders, which are of large size and filled with steam. Around these it passes, drying as it goes, and it is then received between the two "smoothing-rolls" or "damp calenders," which press both surfaces and remove the marks of the wire and felt, which are until then visible on the paper (this necessarily is done before the drying is quite completed). From the "smoothing-rolls" it passes to the second series of drying cylinders, where the drying is finished, and thence to the calenders, which are polished rollers of hard cast-iron, so adjusted as to give a considerable pressure to the paper and produce a glossiness of surface. For writing papers, the paper passes through a shallow trough of size after leaving the drying cylinders, and then passes over another series of skeleton cylinders, with fans moving inside, by which it is again dried without heat, and afterwards passes through the calenders. Printing and other papers are usually sized by mixing the size in the pulp, as already stated. Still following the paper web, it is seen to pass from the calenders to another machine; this slits the web into widths, which are again cross-cut into sheets, the size of which is regulated at will; or if intended for rotary

printing the web passes over a central knife, which severs it in two equal widths, each passing on to a large reel, containing when full as much as 5 or 6 miles length of paper. So regular does the machine run that the quantity of paper on each reel is taken by *time*, not by measure. Paper that is intended for high-class printing, especially for the printing of half-tone process blocks, receives on both sides a coating of enamel made of various substances; chalk being a common one. Such papers are known as "surfaced" or "art" papers, and it is the finish thus given to the surface that renders possible the illustrations seen in the best magazines. The water-mark is impressed on machine-made paper by means of a fine light wire cylinder, with a wire-woven pattern; this, which is called the "dandy roll," is placed over the wire-gauze sheet upon which the pulp is spread, but near the other end of it, so that the light impression of the marker may act upon the paper just when it ceases to be pulp, and this remains all through its course. The nature of the "dandy roll" also determines whether the paper shall be "wove" or "laid," the lines in the latter class of paper being impressed by wires in the roll. The productive power of the machine is very great; it moves at the rate of from 20 to 200 feet per minute, spreading pulp, couching, drying, and calendering as it goes, so that the stream of pulp flowing in at one end is in two minutes passing out finished paper at the other. It has been computed that an ordinary machine, making webs of paper 54 inches wide, will turn out four miles a day.¹

Tests for Papers.—We have spoken of "loading" the pulp with clay, pearl white, etc. This is generally looked upon as an adulteration, and when carried to excess certainly

¹ This description of the paper-making machine is largely taken from the new edition of *Chambers's Encyclopædia*, to which, and to the *Encyclopædia Britannica*, the writer owes much of the information given in this chapter.

is such ; but Mr. Menzies, the writer of the article on "Paper" in the *Encyclopædia Britannica*, insists that the presence of some china clay improves many papers, for it enables them to take a higher finish than if pure ; at the same time, it is believed by the best experts to quite ruin the vitality, so to speak, of the paper, making it impossible to stand damp or moisture, and to completely fail to retain its body or lustre after a lapse of time.

The following is a test for clay. Thoroughly dry the paper, cut off a piece weighing 25 grains, put it in a clean platinum crucible (or a test tube that will stand a high temperature) and subject it to a great heat, allowing the air to have access, so as to thoroughly consume all cellulose and size in the paper. Carefully weigh the resulting ash, which will consist of clay or other mineral substance. Multiply this weight by four, and the result will give the percentage of mineral matter in the paper.

If the paper is suspected of being made with wood pulp, let fall on it a drop of a mixture of three-fourths nitric acid to one-fourth sulphuric acid ; if there is no wood in the paper there will be very little discoloration—only a slight grey tint—when the acid dries ; if there be wood, the paper will assume a dark brown colour immediately upon the application of the acid ; the more the wood, the more rapid the discoloration.

A general test for quality can be made as follows : Apply the tongue to test the sizing, and compare opposite sides together for equality of surface. Look through against a strong light for spots, and note whether the paper be regular in its make. Printing papers ought to "rattle" well and have good strength and surface. When there is a good rattle, and if the paper has a glistening brilliancy of texture, most likely straw is present in the fibre, which, when introduced in excessive quantities, causes the paper to break when folded.

Whether a paper is hard or soft sized can generally be discovered by the feel of it, hard-sized papers being hard to the touch. But a surer way is to apply the tongue; when so wetted hard-sized papers are not much altered, but soft-sized papers become at once flabby and easily torn. When two pieces of hard-sized papers are wetted and pressed together they are apt to adhere.

It is often said that printing papers ought to "bulk well." This means that when felt they should appear to have plenty of body for their weight and good texture; a paper which feels thin and poor is said to "bulk badly."

Kinds of Papers.—The number of kinds of paper is enormous, and each has its appropriate name. "Writings," "printings," and "news" are kinds whose names show the purposes for which they are made; then we have "wove" and "laid" papers, with such prefixes as cream, blue, azure, to indicate colour or tone (azure is light blue). "Bank post," "bill," and "loan" papers are very thin, tough, and hard-sized; so are "tracings," the latter being as transparent as possible. "Browns," "cartridges," "drawings," and "wrappings" are known to all. "Small hands" are thin brown papers; thicker browns are called "middles"; some bag papers are so called, while others are designated as "caps." So far as surface goes, we have "rough," "mill finished," "glazed," "super-calendered," "surfaced," "enamelled," and so forth.

The kinds of papers most used by printers are: For common work, ordinary soft printings; for ordinary illustrated work, printings super-calendered; for high-class work embracing half-tone blocks, surfaced or enamelled papers; and for papers to be written on, of course the various kinds of writing papers.

Technical Terms.—We will now proceed to give and explain some of the technical terms used in connection with paper:—

Right Side, Wrong Side.—The right side of the paper is that which lies uppermost in the mould of the paper-making machine, but which touches the wire frame of the hand mould. It is seldom difficult to distinguish the two, but assistance may be derived from the fact that in papers with water marks, that side which shows up the mark properly is the right side. Of ordinary papers the right side is always smoother than the wrong side, which is more or less pitted. It is highly important that all jobs printed on one side of the paper should be printed on the right side of it, so far as the exigencies of printing will permit of this.

Wove, Laid.—Paper which shows parallel water-mark lines is said to be "laid"; that which shows no such lines is "wove"; the paper this book is printed on is wove. The difference is readily seen by the peculiar transparent marks left in each by the wire gauze or the dandy roll. The "wove" design is best seen on the wrong side; it exhibits very fine pit marks. The "laid" papers have horizontal lines running parallel in one direction, and at right angles to them, about an inch apart, run thicker lines called "chain" lines.

Tub Sized.—Paper which, prior to its final finishing, is passed through animal size or gelatine is said to be "tub sized." Hand-made papers are usually so sized.

Engine Sized.—Paper which receives its sizing in the pulp only.

Machine Sized.—Paper which, in addition to the sizing the pulp gets, receives in the "machine" a coating of vegetable size.

Sizing hardens the surface of papers; some therefore are "soft sized" and others "hard sized" according to the hardness of surface wanted.

Finish.—The smoothness of the surface is called the finish of the paper. This is brought about by the calendering rolls.

Highly Finished means much calendered or very smooth. It does not relate to the quality of the paper.

Super-calendered is the same as highly finished. It means that the paper has been passed through a separate calendering machine whose rollers are all of polished steel, or some of polished steel and others of smooth *papier mâché*.

Surfaced or *Art* papers are those which are coated with a kind of enamel, generally a fine silicious or chalky powder mixed with size, applied very evenly. The surfaces of these papers are so smooth that very fine work can be done upon them, and without them half-tone process blocks would be all but useless.

Enamelled.—This term is generally reserved for papers and cards covered with a more or less thick coating of white lead, though it is also sometimes used to include the “surfaced” or “art” papers. The true enamelled papers are often supplied highly burnished, and in such state they give no little trouble to the pressman, for they take ink with difficulty, and are liable to tear on the surface. The “art papers,” which have usually a silicious or chalk surface, do not give this trouble.

Loft-dried.—Paper which, when taken from the mould, is hung up to dry instead of being dried by passing over hot rollers as is usual. It is only high-class hand-made papers which are so dried.

Ream.—A bundle of 472, 480, 500, or 516 sheets. 472 is a mill ream, 480 a stationer's ream, 500 an imperfect or Scotch ream, 516 a perfect or printer's ream. Hand-made paper has 472 sheets to the ream, *viz.*, eighteen quires insides of twenty-four sheets each, and two quires outsides of twenty sheets each.

Quire.—Twenty-four sheets.

Flat.—Paper not folded.

Quired.—Paper the sheets of which are doubled over once. Several sheets are so folded at a time.

Back.—The crease in paper which is quired.

Outsides.—The outer quires of a ream, usually somewhat spoiled. A quire of “outsides” of hand-made paper is twenty sheets.

Insides.—The perfect paper in a ream.

Loaded.—Paper in which [an undue proportion of] clay or other similar matter is present.

Retree.—Sheets of fine paper not considered good enough to pass as perfect, therefore cast out. Bundles of them are marked thus, XX.

Broken Sheets.—These are torn or damaged sheets. Bundles of them are marked thus, XXX.

Pinched.—A sheet not quite so large as standard size. Thus we have “Pinched Post.”

Deckle Edges.—The rough edges of hand-made paper. These are generally preserved, and often printed books or jobs are sent out with their edges untrimmed to show that the paper is hand made. Deckle edges are imitated in some spurious “hand-made” papers which are in fact made by machinery.

Paper is sold by the ream and by the lb., the price per lb. varying with the quality from 1d. to 1s. or more, and the price per ream varying with the quality of the paper and the weight of the ream. The paper upon which this book is printed is double large post, white printing, super-calendered, 90 lb. per ream of 480 sheets at $2\frac{1}{2}$ d. per lb. = 18s. 9d. per ream. If paper is of a certain make and quality, the weight of a ream will vary according to the size of the sheet. Thus if a ream of double crown paper (20×30) weighs 40 lb., the same paper in double demy ($22\frac{1}{2} \times 35$) will weigh $40 \times (22\frac{1}{2} \times 35) \div (20 \times 30)$, = $40 \times 787\frac{1}{2} \div 600$, or about $52\frac{1}{2}$ lb.

The universal rule for making calculations of this sort may be stated thus:—

If x is the unknown weight of a fixed quantity (*e.g.*, a ream) of paper A (*e.g.*, double demy), whose size is known,

w the known weight of the same quantity of paper B (*e.g.*, double crown), whose size is also known, a the area of a sheet of paper A, and b the area of a sheet of paper B; then—

$$x = w \times \frac{a}{b}$$

In the example given w is 40 lb., a is $22\frac{1}{2}$ in. \times 35 in. or $787\frac{1}{2}$ sq. in., b 20 in. \times 30 in. or 600 sq. in., and putting these figures in the place of the letters in the formula we get $x = 40 \times 787\frac{1}{2} \div 600$, or $= 52\frac{1}{2}$ lb.

Problems relating to the relative weights, prices, etc., of papers are stated in the Appendix, where tables to assist in the calculations are given.

How Paper should be used.—Formerly, when paper always had a surface more or less rough, in order to print upon it satisfactorily it had to be damp when it passed through the press. Since, however, it has been found possible, by means of calendering machines, to give paper a highly smooth and glossy surface, paper so surfaced can be worked dry with brilliant results. Indeed, not only has this glossy paper, worked dry, enabled the printer to give an effect to engravings such as was not dreamt of in the first half of this century, but it has enabled artists to adopt a style of engraving which would be useless if paper had to be wetted before printing; and it has also rendered practicable the invention of photo reproductions and zincography, of which much use is now made for purposes of illustration.

The consequence of this great improvement in the surfacing of paper is that it is now seldom or never wetted, and indeed, apart from the effects produced, dry printing has the advantage of dispensing with the two processes of damping the sheets before printing and drying them afterwards—the latter a very troublesome one, attended often with risk of fire.

It is, however, still desirable for a printer to know how to damp paper, though in most offices the process is now never resorted to. It is used only when some old style papers have to be treated in old style methods to get old style results, but it is by no means certain that printing on damp paper may not again come into vogue for books which have no illustrations in them, for many readers strongly dislike the modern shining page, and find the best work of thirty years ago much more restful to the eye.

The reason paper is wetted is to soften it for printing, because rough-surfaced paper does not receive a perfect impression by the ordinary pressure of the press or machine, and does not receive from the types all the ink laid upon them by the roller. The stronger the paper the less pliability it has, and the more imperfectly does it receive the ink from the whole of the forme, especially if some of the types are not as high as others.

Paper when wetted should not be made too damp; if too much water is applied to it, it loses its strength, and it can with difficulty be got from the type, as the ink sticks to it too much. If there is a very great superfluity of water in any part, or it is what is called "glazed," it will not receive the ink at all, as the oily nature of the ink is repelled by the water. When the paper is too wet and rotten, pieces of it adhere to the forme, and then communicate themselves to the roller, making both dirty, and causing "picks," or small bits of dirt, which take ink and print themselves on the sheet along with the type.

How to Wet Paper.—Paper is wetted—*wetted down* is the usual phrase—in a *tank* or *trough*, and the mode of wetting is to pass a number of sheets at a time through water in the trough, sandwich them between several sheets of dry paper, and then press all together. The trough, made specially for the wetting of paper, consists of two parts, one of them to contain the water and the other the paper. The former is raised considerably higher than the level of the latter. Both

are lined with lead. The water tap is fixed over the trough or cistern which is to contain the water.

In regard to the amount of wetting to be done to paper, it may be said that it depends on two considerations—the nature of the forme and the texture of the paper. If the forme is solid, and the paper hard and well sized, it will require more wetting than if spongy, and the forme open. For an open forme, too, the paper will require less water than for a solid one. The softer the paper is made with water, the thicker and heavier will be the impression when pulled.

Hard, well-sized paper may be wetted three, four, or six times in each quire; while soft, spongy paper should not be dipped more than twice or once in a quire. Perhaps it may be requisite only to sprinkle it every quire and a half or two quires. Hence the wetting of the paper is a matter requiring care, attention, and judgment.

When paper is very highly sized, it should not be pressed while very wet, or the sheets will adhere together. This inconvenience, however, may be prevented very often by putting a little sulphuric acid into the water.

After deciding the proportion of sheets to be damped in a quire, lay a clean ream wrapper on the wetting board, and on it a few dry sheets opened out of the paper to be wetted. (We say opened out for we assume that, following the old fashion, the paper is sent out from the mill reamed in quires folded. If flat, *i.e.*, without folds, there will be no quires, and the number of sheets to be dealt with at each operation must be estimated.) Then take the remainder of the quire and draw it through the water in a semicircular curve. Lay these wet sheets on the top of the dry sheets. Then take the proper number of sheets of dry paper, open them, and put them on the wet, then wet some more and lay them on the pile, and so on. Turn over the last portion of every quire, after leaving the last wet sheet on the heap, so that its back will be opposite that which is on the heap. The object of this is to "break the back" of the paper. The back is the ridge caused by the fold, when sheets are folded into folio. In this way the paper will be got quite flat. Proceed in the same way to wet the remainder. A piece of wrapping paper should be placed between every ream to save future counting.

The whole of the paper being wet, lay the heap in a suitable place, cover it with another wrapper and a wetting board, and leave it about half an hour to soak. After this interval, if it is not immediately wanted, press it with a heavy weight—say about fifty-six pounds—for an hour; then add as much weight as is at hand, for the heavier the paper is weighted in this state the better will be its condition for

printing. The heap thus pressed for twelve hours should be turned and well mixed throughout, and again pressed for the same number of hours.

If the heap be too wet, putting dry sheets between every four, five, or six wet sheets, and pressing it in a standing press, will considerably improve it. If too dry, it may be sprinkled about every quire or so, and pressed as above. It should be understood that the more quickly the paper is drawn through the water, the less it will be damped, and *vice versa*; while the circumstance of its being drained or not will materially affect its condition. There should be as little delay as possible in using damped paper, as it is liable to be damaged by mildew if it remains long on the heap.

CHAPTER LVI.

VARIOUS MATERIALS USED IN THE PRESS AND MACHINE ROOMS.—

Detergents: Pearlash, Potash, Turpentine, Petroleum, Benzine
—Lye Brushes and Troughs—How to Wash a Forme—Oil—
Rags—Paste.

Lye.—The ink is removed from formes—that is to say, they are *washed*—with various solvents or detergents, and a plentiful supply of cold water.¹ Whatever the chemical agent employed, the mixture goes by the name of *lye*, or *ley*.

The usual ingredient is *pearlash*, a pound weight of it being mixed in one gallon of water. It should be stirred up with a stick till the ash dissolves. The harder the water, the greater the quantity of pearlash required.

Potash may be used, and a solution made in the same way.

Caustic Soda may also be used for this purpose. Dissolve 1 lb. of soda in 2 gallons of water, and add $\frac{1}{4}$ lb. of soft soap boiled; then stir well together.

There are also special lyes sold by various manufacturers.

Turpentine is a very favourite detergent with some pressmen, who use it for ink tables, rollers, etc. Its action on the latter, however, is prejudicial if oft repeated.

For cleaning rollers *oil* and *petroleum* (*kerosene*) are highly recommended; indeed a practical roller maker insists that nothing else should ever be used.

Benzine or *benzoline* is unfortunately highly inflammable; but for this it would be the best detergent for ink tables and

¹ A jet of steam direct from the boiler is a good cleanser for formes.

formes. Turpentine and paraffin leave an oily residuum that cannot be removed by wiping. This residuum and printing ink do not work together, and there is a space on the table which does not take the ink. Benzine clears away ink much quicker than lye, paraffin, or turpentine, and quickly evaporates, leaving no trace of grease behind. On account of its inflammability, however, it must be most carefully handled, and should never be used near a light, for the fumes may catch fire before one is aware of any danger. Some pressmen use it for rollers; but the roller maker before referred to condemns it, for, he says, it washes the saccharine matter out of the surface of the composition and soon causes the roller to crack, chip, tear, or melt. "One washing with benzine in summer, especially when it is hot and damp, will often destroy a roller: use only oil in washing rollers."

Lye Brushes.—Lye is applied to the forme with a *lye brush*. Lye brushes are made of various sizes.¹ The hair should be close, fine, and long, in order not to injure the type, yet strong enough to allow sufficient force to be used to search out every interstice in the letter where the ink can have penetrated.

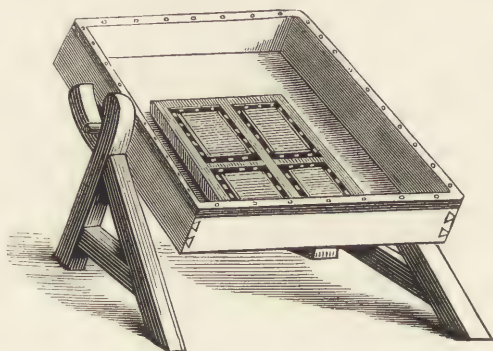
Lye brushes are also made of a substitute for hair called fibre, which is coloured white, brown, or red. This material is very cheap, but cannot be recommended. The best bristles are the cheapest, and do not damage the type. In order to preserve a lye brush it should be rinsed after use, and allowed to drain.

Lye Troughs.—Lye is kept in a jar or other convenient vessel. The best shape is that of an oblong box without a lid, as it is not so liable to be overturned. It should be made of iron and have a strong swing handle.

¹ Large ones are $11\frac{1}{2}$ inches long by $3\frac{1}{2}$ inches broad; middle sizes, $9\frac{1}{2}$ by $3\frac{1}{4}$; small or galley brushes, $6\frac{1}{2}$ by $2\frac{1}{4}$. Pick brushes (see page 43) measure $4\frac{3}{4}$ by 2 in.

A false bottom is useful. It may be made of tin, and be hinged to one side like a lid; it will prevent the lye being spilled or evaporating too quickly. If a few holes or perforations are made in it, a small quantity of lye can be communicated to the brush while the trough is closed, which is a saving in various ways. Besides this, it may be used as a stand for the brush and to keep it out of the lye.

The annexed is a representation of a *lye trough*. The



LYE TROUGH.

trough is suspended on a cross frame and swings on iron ears fixed somewhat out of the precise centre, so that the gravity of the trough will cause it to fall in a slanting position forward. This trough is lined with lead, the top front edge being guarded from the pitching of the formes by a plate of iron.

Washing a Forme.—The following is the mode of washing a forme. Place the forme in the trough, of course with the face of the type uppermost. Take hold of the rim of the chase, and, laying the forme down gently, pour the lye steadily over it. Then swing the trough a little, so that the lye may spread over the face of the letter. Having done so, take the lye brush and thoroughly brush the liquid over the letter, furniture, quoins, and chase. The residue

should then be allowed to run out, and the forme completely drenched with water to rinse away the lye. The forme may then be lifted out and placed on its end, to drain away the liquid.

Oil is a necessity wherever there is machinery. It is best in the long run to use good and not cheap oils. Lard oil or olive oil is best for printers' purposes, though any good machine oil for slow machines will do. The thick oils made for high-speed machinery are not suitable for printing machinery, unless indeed for rotary newspaper machines.

Oil should be imparted by means of an oil can ; one fitted with a valve is best. It should be always at hand, for the want of a little oil may entail great loss of time, especially if a working part "fires" (refuses to work) for the want of it. It should not be stinted, but at the same time should not be imparted too freely ; for too much may be almost as bad as too little.

Where working parts or oil holes are clogged with hardened oil—or "gummed" as it is called—petroleum should be applied. This will soon loosen it ; in fact, it is not a bad plan to apply a little kerosene to all oil holes and working parts occasionally, taking care to wipe them afterwards and oil up again subsequently. Holes much clogged have sometimes to be first picked with a bodkin. For the runners of a machine, Russian tallow is the most suitable lubricant.

On account of the inflammable nature of both turpentine and kerosene, it is advisable that they should be used only from a machine oil can that has a valve fitted to it.

Rags are necessary for cleaning. Wipers made and sold for the purpose are best. Cotton waste is also useful ; but whatever kinds are used they must be carefully looked after when they are saturated with oil. If allowed to collect in a corner, they generate heat, and spontaneous combustion has frequently taken place under such circumstances, to the

destruction of much valuable property. Old rags when done with are best destroyed at once.

Paste.—Paste is a commodity constantly used in the printing-office, and it is well to know how to make it properly. The following will produce a very tenacious and durable paste: Dissolve $2\frac{1}{2}$ oz. of gum arabic in 2 quarts of water, and stir into it 1 lb. of wheat flour until the whole becomes of a pasty consistency. It is then to be heated, and $1\frac{1}{2}$ oz. each of sugar of lead and alum, dissolved in a little water, added. The composition must be well stirred until it shows signs of boiling, when it must be removed from the fire. Add, while hot, 6 drops of carbolic acid. The peculiar odour of the acid may be removed by the addition of a little cloves or other perfume. Paste so made will keep a long time.

Another recipe, involving less trouble and expense, is this: Take half a quartern of flour and mix with it 2 oz. of powdered alum; add cold water till it is just liquid; then boil till it thickens, stirring the while.

PART II.

THE ART OF THE PRESSMAN.

CHAPTER LVII.

AN OUTLINE OF THE PRESSMAN'S ART.

WE have now acquainted the reader with the various forms of printing presses and machines, and with the methods of applying the ink, and the apparatus therefor, and we have also discussed the nature and properties of the ink itself, the nature and condition of the paper to be operated upon, and the miscellaneous materials used with them. We will now proceed to instruct him in the practical art of the pressman, which art may be summed up as the art of producing, from the forme supplied, the best possible impressions with the apparatus and material at command. To achieve this end, the pressman must have first a suitable press or machine, suitable ink, suitable paper or card, and proper rollers for imparting the ink, and each of these must be in the best possible condition, and managed with the best possible skill. A good pressman—we use the word in its generic sense—must know all about the various kinds of presses and machines and their mechanism, their respective merits and demerits, their capabilities and limitations of performance; he must know how to keep them in good condition, and what is to be done should any part get slightly out of order; he must know the various kinds of inks, and their behaviour when used with the different kinds of paper, and in different

temperatures; he must know all about rollers, how to cast them, and how to manipulate them so as to get the best distribution of ink for the various jobs which he may have to execute, and the best means of imparting the distributed ink to the formes, for some formes will contain type only, while others will contain engravings or photo-process blocks, some will be full and even throughout, and some will have large white or light spaces in juxtaposition with close or heavy matter; he must know how rollers vary in different stages of their age and in different temperatures; how they, and the ink they distribute and impart, must be humoured in different weathers and in varying circumstances, and lastly, and certainly not least, he must know what it is to "make ready" a forme before the printing from it begins.

On the subject of "making ready" we will say a few words before proceeding further. In the synopsis of printing contained in the second chapter we stated that, as the iron platen of the press was hard and unyielding, it was necessary that there should be interposed between it and the sheet of paper to be printed on either a piece of blanket or several sheets of paper, and what was there stated of the hand press and platen machine is true of the cylinder machine also. The substances so interposed are called the "packing." In the case of the hand press this packing is placed in the tympan; in the case of the treadle-platen and the cylinder machines it is placed on the platen or cylinder. Packing composed of a blanket, with or without sheets of paper, is called "soft packing"; when no blanket is used the packing is called "hard packing," and this may vary in hardness from several sheets of thick soft paper to a sheet of card or even of glazeboard. It is obviously a matter of extreme importance that the packing should be appropriate to the kind of forme to be worked and the kind of paper to be printed on, and instruction is necessary to enable the question to be rightly determined.

But making ready a forme seldom or never stops at packing; it often happens that the forme contains, along with metal type, a wood-cut or other block, or some lines of wood letter; these may not have precisely the same height as the metal types, and, if low, must be "underlaid" by pasting one or more thicknesses of paper under them till they reach the proper level. And now, having done everything we can to make the impression even, paradoxical as it appears, we shall find that we cannot get good results until it is made uneven; in other words, wherever the faces of types are bold, and wherever the shading of an engraving is densest, the pressure of the platen or the cylinder must be greater than elsewhere, or the full quantity of ink will not be taken from these solid parts of the forme, nor will it be transferred with sufficient force or clearness to the paper. To obtain this variation in the pressure, it is necessary to paste on the packing, or on the packed tympan of the press, sometimes one, sometimes two, and sometimes three thicknesses of paper, exactly in those spots where the greater pressure is required, and where it will meet the more or less solid parts of the forme. Pasting on these pieces, which is a work of great skill, and one requiring much judgment, is called "overlaying the forme," and the pieces of paper so pasted are called "overlays."

Nor is this all: the pressman has to see that the impression is so given that the outer margins of the sheet are exactly what they should be, and whenever the sheet has to be twice printed, as nearly every sheet which forms part of a book, or on which more than one colour is printed, must be, he must take care that the second impression is made exactly in its proper place, or, in other words, he must make the formes "register."

Such is a very brief outline of the art of the pressman or machine-minder who executes ordinary book and jobbing work, but he who would pursue the art in the higher branch

of picture printing in colours will have to extend his study to chromatics, and make himself fully acquainted with the use of the various pigments at his disposal.

It is in the practice of this art of the pressman in its various branches that we now propose to guide the learner, and let us state at the outset that of all the kinds of presses or machines mentioned in a previous chapter there are but two or three that he is likely to have to work in most offices, namely, the treadle-platen machines and the single-side single-cylinder machines. Till recently we might have restricted these last to the stop-cylinder machines of the ordinary Wharfedale class, but the necessity for increased speed and fine printing combined has induced progressive printers to lay out large sums in the purchase of fine art machines, either of the stop-cylinder genus or of the two-revolution class. Yet there are many among the most thoughtful teachers of presswork who believe that the best introduction to the art is gained by a thorough acquaintance with the hand press and the methods of using it, and we shall, in this work, take our reader first to the press room (as distinguished from the machine room); for, though the hand press is every year becoming more scarce—and we are acquainted with at least one modern firm of high repute who have never had a hand press (except a galley press) in their establishment—there are yet sufficient jobs of a kind to render it still a desirable, if not an absolutely necessary implement to have in a printing office, and at it the tyro will learn some parts of the business of a printer better than at the platen or cylinder machines.

CHAPTER LVIII.

WORK AT THE HAND PRESS.—The Modern Uses of the Hand Press
—Necessity for Knowing all its Parts—Positions of the Ink
Table and Bank and Horse—Tympan—Points—Friskets—
Bearers—Other Accessories—How to set up Presses.

At the present day the hand press may be said to be used only for the following work: Proof-pulling, the proving of blocks, colour work of a special nature, poster work in small quantities, and special high-class work of which only a few impressions are required.

The first thing for the beginner to do is to make himself thoroughly acquainted with the construction and mode of working of the press itself. To a great extent this knowledge may be acquired by a careful study of Chapter L., but it will be more efficiently imparted if the learner has to assist in erecting a press which has been delivered in pieces at the printing office. Indeed every printer ought to know how to set up and take down his presses and other machinery, not only in order that he may be able to remove different parts when they require cleaning, but also that he may clearly understand their mechanism. We shall therefore, in the supplemental portion of this chapter, give directions for setting up and for cleaning both an Albion and a Columbian Press.

It has already been stated that the ink table used with a hand press is a separate piece of plant, and its construction and use have been detailed on pages 563 and 564. The side of the press at which the pressman stands is that

nearest to the reader in the illustration on page 17, and assuming him to stand at the rounce handle with his back to the reader, the proper place for the ink table will be at his left hand, the front of the table being at right angles to the side of the press. On his right hand will be placed a wooden table to contain the sheets which are to be printed, and those which have gone through the press. A table of peculiar construction, called a *Bank and Horse*, is used where there is sufficient hand press work. The raised desk-like part is called the *horse*, and the sheets to be printed are placed on it; while the flat table-like part is called the *bank*, and on it are placed the sheets after they have received the impression. When the heap on the bank gets large, it can be removed to the ledge or shelf below. The usual dimensions of a bank and horse are: height, 3 ft.; width, 22 in.; length, 3 ft. 4 in.

The press having been duly set up, the printer must turn his attention to the *tympan* and *frisket*.¹

Tympans.—We have already explained that the tympan consists of parchment² stretched over a frame of iron, and tightened like the top of a drum. By means of hinges connected with the carriage, it is folded over the forme like a lid. At the two opposite corners are arrangements which serve to keep the tympan level, and to enable a second frame, called the *frisket*, to be interposed between the tympan and the forme. These are called the *frisket screws*. At the sides of the tympan frame are the *point grooves*. Both of these will soon be described.

The tympan is double, and consists of the inner tympan and the outer tympan. The latter of these is nearest to the type, the former next to the platen. The iron frames on

¹ See page 572.

² Sometimes of linen, and sometimes even, for proof pulling, of manila paper; but parchment is better whenever available.

which the tympan is stretched are called the "inner tympan frame" and the "outer tympan frame."

How to make a Press Tympan.—Parchment for tympan is sold by the printers' brokers, cut up into various sizes to suit different presses. The characteristics of a good skin are its uniform thickness throughout, and its freedom from imperfections or cuts.¹

Lay the skin, which should be a few inches larger than the tympan frame, on a flat board or the imposing surface, with the smoothest side downwards. Place the frame of the outer tympan, with the tympan hooks uppermost, on the top of it. Cut the skin to the shape of the frame, but allow it to be about two inches larger at all sides. If a very small tympan is wanted, a less margin will be necessary.

Now cut two quite small holes opposite the tympan hooks at the bottom of the frame, through which put the hooks, and see that they afterwards turn round freely. Paste the frame very carefully and thoroughly with good fresh and thick paste, and afterwards the edges of the parchment to a sufficient extent to cover the frame. Cut out with a pair of scissors square pieces at the corners, in order that the parts which lap over may be neatly folded over the frame, without leaving thick creases at the corners. Take a paper knife or folder, and, after tucking the parchment well over the frame, smooth it in the part that is under the frame inside. Get it quite smooth and firm, without any creases. Go over it with the fingers repeatedly for this purpose.

Now operate on the opposite side of the tympan. Paste the parchment, draw it tight, turn it over, and tuck under as before. Cut the parchment so that it can be folded over the point grooves and tucked in. Make small holes opposite

¹ Old deeds, leases, indentures, etc., written on parchment are frequently used as tympan, as they may be had from the lawyers at a low cost. Care should be taken, however, that they are not faulty or thin at the places where they have been folded.

each side hook. Paste both sides well, and put the hooks through, as was done in the case of the other side. The parts that would lap over the grooves must be put through the grooves, but on each side turn over the frame as was done at the bottom.

Finally, with the thumb and fingers pull all the sides until the skin is stretched quite tightly.

The inner tympan is covered in the same way as the outer, but there is not so much trouble in doing it, as there are no projections on the frame. It would be well to begin to learn the art of covering tympan on the inner tympan.

After the paste is quite dry, thoroughly wet the parchment in order to shrink and tighten it.

The whole art of covering a tympan consists in the accuracy with which the cutting out and turning over of the parchment are done.

The parchment on the outer tympan should have its smooth side next to the forme. The parchment on the inner tympan should have the smooth side next to the platen.

Linen or cambric for making tympan is very much cheaper in first cost, but it soon stretches or becomes "baggy," and then it causes what is called "slurring." Linen is also more liable to be torn than parchment, and never gives, especially over small type, the fine sharp impression of the other. This kind of tympan is pasted on the frame like parchment. A few stitches may be put in to secure it, or to tighten it a little when it has given way. The inner tympan should have a sheet of strong paper pasted over for better surface.

Parchment is quickly affected by the weather, which, when damp, causes tympan made of it to become quite loose. For high-class work, therefore, such as proofing process blocks, a satin tympan is recommended. An expe-

rienced pressman gives the following directions for making it: In the first place, an ordinary parchment is put on the tympan and allowed to dry tight. Then the whole of the middle of the parchment up to three inches of the edge of the frame is cut out, and in its place a piece of satin of good quality, about an inch wider than the piece of parchment removed, is sewn tightly to the edges of the parchment which have been cut away. This forms a satin tympan; but inasmuch as overlays cannot be stuck upon the bare satin without spoiling it by the paste, it is necessary to cover the satin tympan front and back with two sheets of thick cartridge paper. To do this, after being cut to the proper size, the cartridge should be laid upon a flat board, damped all over, and pasted all round about two or three inches from the edge, and stuck inside and out on to the tympan. Of course, the paste only goes as far in as the parchment rim, the satin itself being untouched by it. When these sheets become quite dry the tympan will be as tight as a drum, and will give a beautiful even impression.

The Packing.—Between the two tympan is placed *the packing*. This, as we have already stated, is necessary in order to ensure that each part of the forme shall be duly pressed, and to prevent the metal of the platen coming in contact with the type and so crushing it. This packing may consist of blanket, of sheets of paper, of cardboard, or any of these combined. Packing composed of sheets of paper, pieces of cardboard, glazeboard, etc., is called “hard packing,” and is almost always used when paper is printed dry. Blankets consist of pieces of woollen material, something of the nature of the domestic article so called, but of at least two degrees of softness, called “fine” and “stout.” They are sold in pairs, being cut to the different sizes of presses.

Points.—In printing, it is of very great importance that the sheet should be accurately laid on the tympan, and

in such a manner that on the second side being printed, each page, and even each line, may fall exactly on the corresponding page and line of the side first printed. To produce this effect two iron *points* are fixed in the middle of the sides of the frame of the tympan, which make two small holes in the sheet during the first pressure. When the sheet is laid on to receive an impression from the second forme, these holes are placed on the same points, so as to cause the two impressions to correspond. This is termed *making register*. In jobbing work sheets are laid to pins fastened in the tympan, but as sheets often vary in size this does not give the accuracy of lay necessary for perfect register in bookwork and colour printing.

Points are pieces of steel with projecting pins, called spurs, at one end, which perforate the paper. There are two kinds, called respectively *spring points* and *elbow spring points*. Fig. 1 shows the *spring point*, as used for a sheet of 8vo or similar forme.



FIG. 1.

Fig. 2 shows an *elbow spring point*. This is used for 12mo or a similar forme. The shape is altered owing to the imposition of the different

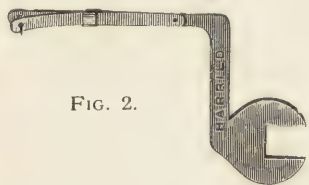


FIG. 2.

formes. The spurs have to come exactly in the centre, between the pages, so that the spurs may fall into the grooves made in the cross-bar of the chase. In the 8vo chase the cross-bar is in the middle, but in the 12mo it is not so, and the elbow shape enables a point to be used which will extend from the groove

of the tympan frame and cover the groove of the chase. These points are secured in position by screwing them with a nut (Fig. 3) to the tympan frame from the outer side. These nuts work in grooves in the sides of the tympan, called the *point-screw grooves*.



FIG. 3.



FIG. 4.

Paste points (Fig. 4) are used when it is not convenient to fix points in the tympan grooves. They are flat pieces of steel, and are fastened to the tympan in any position required, by pasting them and partly covering them with strong brown paper.

The Frisket.—In order to prevent the sheet falling off the tympan while it is being folded over the forme, and to prevent, also, the sheet being inked or soiled in places where it might come in contact with the furniture or the chase, a



BED, TYMPAN, AND FRISKET.

slender frame is placed over the tympan, and this frame is covered with paper, cut out in the middle to the shape of the forme, or rather of the printing surface. This frame is called the frisket. It is hinged to the upper extremity of the tympan. Thus, the frisket is first folded down over the tympan, and the tympan next folded down over the forme. See illustrations on pages 569 and 574.

In the annexed diagram, the horizontal part, *b*, is the type-bed or coffin, with the forme on it; the next division, *t*,

is the tympan, and the upper part, *f*, is the frisket, pierced with four rectangular holes for the printing of the four pages on the bed.

To avoid the trouble of cutting out frisket sheets, elastic bands are sometimes extended from one side of the frame of the frisket to the other. Sets of bands may be had, fitted with small brass catches at the ends. Strings run across and fastened to the sides of the frisket serve the same purpose.

A projecting piece of wood is generally fixed upon the ceiling or the wall, in order that the free end of the frisket may rest upon it when it is "up." This is called the *frisket stay*.

In jobbing work the frisket is commonly dispensed with.

Bearers.—To bear off the pressure exerted by the platen on the edges of the forme, and for other purposes, which will be described in the next chapter, *bearers* are used. They are strips of wood, type high, placed along the side of the carriage. Other kinds of bearers are improvised out of old wood types or large metal ones, pieces of cork, strong paper rolled or folded up, reglets, etc.

Other Accessories.—The pressman requires, in addition to the appliances already described, a hammer (one, called a *sheep's foot*, having an iron handle with a claw at the end, is usually supplied with the press), an oil can for oiling the working parts, wrenches for tightening up the nuts, and a sharp pocket knife for use in making ready, as hereafter described. Paste, too, must always be at hand.

How to set up an Albion Press.—Put the feet on the frame to their respective marks. Then screw the ribs on the frame with the bolts, nuts, and plates that are supplied with the press. There are two bolts and nuts for securing the rib leg and the bolster, and these must next be inserted. Place the table upon the ribs, and fix the rounce in its bearings under the ribs, after which suspend the piston by passing the main bolt through it and through the hole in the frame head. Next put the spring-box upon the head of the press with

the spring and spring bolt in it. Now connect the spring bolt with the brass links of the piston, by passing the long flat steel bolt through them. After this put in the chill and pass the main bolt through the holes at the top of the piston, passing it through the chill as well as through the hole in the frame head, which will keep the chill in its place. Put in the pressure steel with its bright side to the front; then connect the joint and rod to the chill, and then the bar handle, and secure the small staple, which has the screw and nut in it, to the back of the frame behind the elbow-piece of the bar handle, by which you will be able to stop the bar handle at a shorter pull if required. Place the platen upon the table, and put the four notched head bolts into the holes as marked, and drive in the four wedges to keep the bolts from slipping back. Lift the platen and pass the screwed parts of the bolts through the four holes in the piston and put on the nuts. Screw down the nut on the top of the spring till it brings the bar handle back.

Let a forme now be placed on the table and run it under the platen. Make a pull with the bar handle so as to bring the platen fair with the face of the table. If necessary, put one or more of the thin square pieces of iron between the piston bottom and the top of the centre of the platen. Tighten up the four nuts of the platen bolts, a little at a time, so as to tighten them regularly.

Should the platen not come fair with the face of the table, slacken one or more of the nuts which secure the platen to the piston on that side which is farthest from the table, and tighten up the nut or nuts on that side which is nearest the table, by which means it can be easily got fair, and prevent mackling¹ or slurring. Should the platen and table not range fair, slacken the nuts which secure the ribs to the frame, and the ribs may be moved a little on either side as the case may require. Afterwards tighten up the nuts again.

The press is working to its full power when the handle bar stops against the cheek of the frame, which it should always do on heavy formes.

To clean the press, put one end of a short bar on the round part of the piston when the bar handle is pulled home, and the other end under the head of the press; then push back the bar handle, and it will leave the chill and pressure steel quite disengaged. Knock the connecting rod pin and the main bolt a little, and they may be taken out.

¹ *Mackling* is an imperfection in the printed sheet, part of the impression appearing double.

The main bolt should be taken out about once a week and well cleaned and oiled, which is easily done at any time. All that is necessary is to take out the pin at the back and knock it out.

The small holes which communicate with the respective bolts require a small quantity of oil occasionally, and the use of the purest Florence flask oil is recommended as the cheapest in the end. It is easy to judge whether everything is in its proper place by the perfect ease with which the bar handle moves.

In beginning to work a new press, let the impression be rather light, and increase it gradually until such an impression as is desired is obtained. Variations of pressure are effected by means of the wedge in the chill. The farther this wedge is driven in, by turning the screw, the more pressure will be obtained. If the pressure is too great, turn the screw the reverse way.

To set up a Columbian Press.—Put the feet on the frame or staple in their proper places, and erect the staple upon them. Next fix the bar handle to the side of the frame, together with its proper bolt. Put the principal lever in its place, and then put in the bolt which connects it with the staple. Put the angular or crooked part (which has one square and three round holes) through it in the mortice, which will be found in the projecting part of the long side of the staple. Now place in the bolt that attaches the angular part to the staple.

There are marks in the extremity of the edges of the heads of these two last-mentioned bolts, and corresponding marks over the holes through which they pass. Put the bolts in so that these marks meet together and correspond; and so on until all the remaining parts are in their respective places.

The four screws for the platen, which have heads on one side, are intended to attach the platen to the piston, which, being placed in their respective places, are secured by the four small blocks of iron which are supplied with the press.

To adjust the platen so as to make it approach the forme exactly parallel, place a forme on the carriage. Then square the platen to the tympan, make a pull, and hold the bar handle back, while an assistant screws the four platen screws equally tight.

The ascent and descent of the platen are regulated by the nut or iron screw which connects the bar handle and the top counterpoise lever. The platen must be hung so as to clear the tympan when the carriage is run in.

The impression may be increased by lengthening or shortening the connecting rod attached to the angular lever at one end and the bar

handle at the other. Turning the screw in the centre of the rod to the left *lengthens* the rod and brings the handle nearer the workman, *decreasing* the pressure. Turning the screw to the right *shortens* the rod, takes the bar handle farther from the workman, giving more pull, and thus *increasing* the pressure. As in the case of the Albion press, the ease with which the bar handle moves is the criterion of everything being in its place.

CHAPTER LIX.

FIRST LESSONS IN PRESSWORK.—Preliminary Operations—Dropping the Forme—Centring it—Fastening down—Marking round—Putting in the Blanket—the Tympan Sheet—How to pull the Press—How to Ink—Pulling a Proof.

IN printing at the hand press, two pressmen used generally to work together. One of them “pulled,” or worked the press; the other “rolled,” or inked the type.¹ We shall suppose, for the sake of clearness, that you, the learner, are going to perform both operations.²

Let us imagine that you are standing at the side of an Albion press, near the handle of the rounce. On your left hand will be the inking table, with a roller on it; on your right hand, the bank and horse. We will also suppose that the job on which you are about to work is a quarto hand-bill. The press for such a job might be as small as foolscap or as large as double demy; it makes no difference that it is much larger than it need be, save that it will require more strength to work it.

Preliminary Operations.—Run out the table to its fullest extent, by turning the rounce handle. Raise the tympan to its proper inclination. See if the table of the press is perfectly clear of particles of dirt and is quite dry. If there is any dirt on it, the types lying over such places will be raised higher than their fellows, and the impression will be uneven.

¹ The two men so working used to call one another “partner,” and they shared between them their earnings when working on piece.

² This mode of working was called “working half-press.”

If there is any water on the table, it will rise up between the types in the course of working, get to the face by means of the roller, and prevent the ink in such parts adhering to the types; the printing, therefore, will be black in some places and without colour in others. The table being dry, or made so, rub it over with an oiled rag.

Take up the forme by the chase. Rub its back over with a hard brush, to ensure that there is no dirt or foreign substance adhering to it; also see that it is quite dry. If it be wet, do not lay it on the press till you have dried it. This may be done at a fireplace, or by rubbing it with a soft rag.

If letters drop through when the forme is inclined, it denotes bad justifying of the matter or imperfect locking up. If the forme is very loose, place a board behind it and remove it to the composing room. Lay the two down and lock up again. When tight enough, lift the forme on to the imposing stone, loose the quoins a little, plane down, and lock up thoroughly. Then return the forme to the press room. Letters under a forme usually cause the types standing over them to be battered when the first impression is pulled, and cause immense trouble in correction, besides wasting time just when it is most valuable—when the job is going to press. The fault arises entirely from carelessness on the part of the compositors. Sometimes, to get down on the press a forme that is badly justified and loose in different parts, a piece of paper is pasted over the back, which prevents the letters falling out. We need hardly say that this is a very unworkmanlike expedient.

Dropping the Forme.—The forme being all right, “drop” it smartly on the bed of the press.¹ Now, with your apron, dust off the face of the forme, to clear it of any dirt that may have become attached to it. The head of the forme ought to be away from you; if it is not, lift it and turn it round.

¹ The mode of dropping it is the same as that described on page 219.

If, however, the forme is a heading, or some kind of job that cannot be printed in this way, it may be placed cross-wise on the bed, with the foot nearest the end of the carriage, and the head towards the platen.

Centring.—The next thing is to “centre the forme,” that is, to get the forme in the middle of the bed, so that when the carriage is rolled in the forme will be under the centre of the platen. The type matter must be in the centre, whether the chase be so or not.

Centring must be effected with reference to both dimensions of the table, length and width. Notice that on the front edge of the platen there is a nick cut; this is a guide for centring the forme as between the two long sides of the table. Run in the carriage, by turning with the left hand the handle of the rounce, until the type matter is well under the mark. Shift the chase if the mark be not over the middle. Then again turn the handle and run out the table to its full extent.

The reason for centring is that the platen always “gives” more or less when the type underneath is out of the centre. The piston is placed, of course, in the middle of the platen, and there are strong stays extending from the part where it comes in contact with the platen, in several directions, but these do not give absolute rigidity. Hence it is very dangerous, and may even break the platen altogether, to work a forme out of the centre without special precaution.

Bearers.—This precaution consists in the use of “bearers,” when the forme is either a very small one or the position of the job on the sheet compels it to be placed out of the centre of the bed. These bearers are pieces of cork, wood, or metal, type high (old letters, if large, will do), placed as far from the centre on one side as the full extent of the type forme is on the other. For purposes of impression then, bearers practically extend the area of the forme until the whole is really in the centre of the table and the platen.

Always beware of unequal strain on the platen ; it will inevitably injure, if it does not break, the press.

If bearers are used, means must be taken for preventing them from printing, or even giving a blank impression, on the sheet. They often have to be removed before each inking and then replaced.

Fastening the Forme.—Having got the forme in its proper position, it must be secured there, otherwise the motion of the carriage in running to and fro, or the action of the roller, will cause it to shift and destroy the results of several subsequent operations.

This may be done in various ways. The most common plan is to melt compo in a flame, stick a quoin in it, and while quite warm and soft fix the quoin tightly on the bed of the press against the side of the chase. One quoin fixed with compo at each side will hold a forme quite rigid.

Another plan is to put a few pieces of wood or metal furniture between the end of the forme and the tympan hinges—exactly filling up the space—and some furniture with a sidestick at the other end. Quoin up tightly, and the forme cannot move. Select a proper quoin, and do not “vamp up” the job by putting in leads, which is a reprehensible practice.

Another plan of securing the forme is to place small chases on either side of it, and tighten them with quoins and a piece of sidestick. This is only practicable, of course, when the forme is very much smaller than the bed of the press.

Next, “*mark round the forme.*” This is to know its exact position if it has to be lifted or should happen to get shifted. Run a piece of slate pencil, or the end of a lead, closely round the chase ; this will leave a mark on the bed of the press sufficient to enable you to restore the forme to its exact place hereafter.

Packing the Tympan.—Consider the nature and condition of the type in the forme and of the paper to be used. If, as

often happens in hand-bill work, the type is worn and the paper common, the latter will be best worked damp, and soft packing—e.g., a blanket—will be suitable. Turn down the tympan on the forme, undo the tympan hooks, remove the inner tympan and insert the blanket, taking care that it is straight, even, and free from creases; put the inner tympan on again, fasten it with the hooks, and raise the two to the proper position. When required, the blanket should be rubbed and worked in the hands so as to soften and equalise the nap all over.

Had the type been unworn, and the paper calendered, the best packing would have been half a dozen sheets of moderately stout white printing paper, and these would have been inserted instead of the blanket.

The Tympan Sheet.—This is a sheet of paper fastened upon the tympan as a guide to the pressman in laying the sheets when working off a job. It should be of the same size as the tympan and be pasted on to it at the four corners.

Take a sheet of "its own," that is, a sheet of the paper belonging to the job; lay it on the forme. Be sure to put it on quite even and straight, with the exact margin on all sides that you would wish to see in the job. Damp the tympan a little with clean water and a sponge; turn the tympan down on the forme with the right hand, run in the carriage by turning the handle of the rounce with the left hand, until the platen is over the middle of the tympan, and pull the bar with the right hand. Do this carefully; beware of too heavy an impression at first. It is better to be too light, and then by degrees to ascertain the proper pressure to be employed.

Pulling.—Pulling the press is, as we have said, done with the right hand. It is advisable to "pull the bar home;" that is, as far back as it will go, until the knuckle of the arm comes in contact with the cheek of the press. If in doing so the pressure is felt to be strong, desist for a

moment and adjust the pressure, according to the kind of press used.

The method of adjusting the pressure in the Albion press is to turn, one way or the other, the screw under the piston ; in the Columbian you turn, one way or the other, the screw in the connecting rod.

Underneath the press, and securely fastened to the floor, is a strong piece of wood called the "footstep." The pressman places his right foot against this at the moment of pulling the bar, and, slightly raising himself, obtains a swing, which adds greatly to his strength. This footstep should be placed in a situation suitable to the stature of the pressman. It is not necessary in the case of small presses, and, though available, need not be used with a large press if the forme on it is only a small one.

When you have pulled the bar home let it stop—or "dwell"—there for a moment or two. This "dwell" is important when actually working off a forme, as it gives the ink an opportunity of fastening itself well upon the paper.

Be careful in pulling not to let the bar suddenly fly back, by which the press might be broken. There is a powerful force¹ in the head of the press, causing the bar to go back by itself without being thrust by the pressman. Hence if you suddenly let go your hold, the bar is acted on by this power and flies back. You should rather restrain its movement, and keep it in your hand until it is fairly back in its place.

There is another caution to be given in respect to pulling. Do not pull the bar until the carriage is quite still ; if arrested suddenly, by the action of the platen coming down, a "slur" will be caused. This is an indistinct impression, resulting from the types moving laterally when in contact with the paper.

¹ This force is in the Albion press a spring, and in the Columbian press a balance weight.

Do not run the carriage in too far; this will be known by a sudden "bump" occurring, through the carriage coming to a full stop against the end or the "stop" of the ribs. On the other hand, do not bring it out too far, or another "bump" at the opposite end of the rails will indicate it. The danger of doing this is, that the girth is liable to give way, and a new one may be necessary.

If the press be in good condition, a very slight movement of the left hand on the handle will cause the carriage to run in as far as may be required.

To recapitulate—Pulling consists of

1. Folding down the tympan on top of the forme.
2. Running in the carriage by turning the handle of the rounce with *the left hand* from you.
3. Pulling home the bar with *the right hand*.
4. Running out the carriage by turning the handle of the rounce with *the left hand* towards you.
5. Lifting up the tympan to its proper inclination.

This may appear unnecessarily minute to practical printers, but we have seen beginners who for some time, in the absence of instructions, tried both to turn the handle and pull the bar with the right hand.

Tympan Again.—Reverting to the tympan, if it has been sufficiently damped, and there has been sufficient pressure on the type, the sheet of paper, on raising the tympan with the right hand, will be found to have adhered to it. If it has not, go through the process again, damping more and pulling a little harder.

Now paste the corners of the tympan sheet to secure it. Take care that the paste does not come over any part of the type, or it will cause a heavier impression there than over the other parts.

Put in pins at the edge of the sheet, as a guide in laying subsequent sheets. These must of course be in such positions as to secure the proper margins to the printed

sheets. Two pins on the longer side and one on the shorter will be sufficient. Avoid having too many pins; unnecessary ones only tend to make the sheet crooked.

There is a little art in putting in pins. They should project half an inch or so over the sheet to be printed; but they should go completely through the tympan, underneath it, and come out again by their other end. The head must be in the direction of the type. They must be quite firm, so that when the sheet is well pressed home to the part almost in the middle, where the projection begins, they will not shift. The head should be raised a little, so as to allow the sheet to go in comfortably; for this purpose the pin must be bent somewhat. Above all, they must not ride over any part of the type, or they will batter it when the platen comes down. If the margin is very small, they must be got in some open space, such as over quads and leads, etc. Care in setting the pins neatly and accurately will be well repaid subsequently.

Inking the Forme.—Take another sheet of paper and put it in the pins. Then “roll the forme”—*i.e.*, ink the type. This brings us to the mode of inking.

Take the can of ink and remove the lid. Then with a palette knife spread a little on the top of the ink table.¹ Let it be in a long even streak, the full width of the table. Beware of taking too much; for present purposes try how little will be sufficient. Spread it out as thin as possible, avoiding clots. Take the roller in the right hand, and just touch the ink with it. It will take up a narrow streak of ink; the next thing to be accomplished is to get this nicely distributed all over the roller. Lay the roller down lightly on the table and draw it towards you. When you have got to the end of the table it will be found that the cylindrical

¹ If a cylindrical inking table is used, some of these operations will be unnecessary,

shape has left a series of parallel streaks, while between them there is no ink whatever. Repeat, and some of the intervening spaces will have become filled up, provided the roller was not put down on exactly the same place. Do this over and over again, shifting the position and direction of the roller a little each time, and each time the coating on the table, as well as that on the roller, will be more complete and thinner. Go on, doing it quicker each time, till the whole is beautifully coated with a thin film of ink. This is called *distributing the ink*. It is a very important part of presswork, and pains should be taken to do it properly. Two cautions are necessary:—

Avoid having too much ink; it is easier to increase the quantity than to decrease it. The mode of increasing is, of course, to take a fresh supply. To decrease it, which is rendered necessary by the roller being "too black," there are two methods in vogue, apart from that of completely washing it. One is to scrape the roller with a knife and so to remove superfluous ink. (Be very careful in doing so that you do not cut the roller.) The other is to lay a piece of strong clean paper on the ink table and distribute the ink on that, till it is nearly all off. The paper must be held with the left hand at the upper end, or it will go round the roller and adhere to it. If strong paper be not used it will tear, and if there be any dirt on it, it will get mixed with the ink. This is called "sheeting the roller." The golden rule is to have too little ink rather than have too much, and to go on taking a little more until the proper quantity is attained.

Secondly, be very careful not to let the roller "run into the ink"—*i.e.*, to run unintentionally into the streak of ink put down by the palette knife or brayer, or the roller will be "smothered," as it is expressively said. If not perceived, and the roller is applied to the type, there will be great blotches of ink in different places, perhaps filling it up and

causing "monks," or black patches, in the impression. The forme may then have to be lifted, washed, dried, and again adjusted on the press.

Having got the ink table and the roller nicely and evenly coated with the ink, you may roll the forme. Do this lightly, yet with sufficient pressure to cause the type to take off some of the ink. Very likely the forme will not "take" the ink at first, but instead of getting more ink, briskly and repeatedly roll it over, even "dabbing" it in parts which repel the ink. Avoid inking the chase, furniture, or the press table; the roller should only touch the surface to be printed from. You should roll first in one direction and then in another.

Be careful that the suction of the roller does not draw out any of the types. If these lie on the surface unobserved, and the press is pulled, they will cause a "batter."

Replace the roller on the inking table. Turn down the tympan as before, run in the carriage, pull the bar, "dwell," run out the carriage, lift the tympan, and you will find you have pulled your first "proof."

Examining the Proof.—This first proof must be very carefully examined, and its imperfections will afford a useful study to the young printer. We will refer to the most ordinary blemishes *seriatim*, and append the mode of remedying them.

Ordinary Imperfections.—*The proof may be crooked.*—This shows that (a) the sheet was not properly laid to the pins; or (b) that the pins were too loose, and allowed the sheet to move when the tympan went down; or (c) that the pins were not properly placed. The manner of correcting these faults is obvious.

The proof may be too pale.—Take more ink on the roller, as already directed. Be careful that too much is not taken.

The proof may be too black.—Take some ink off the roller by "sheeting" it, as already described; or if there be a

corner of the ink table that has not received ink, distribute there, and the colour on the roller will be reduced.

The proof may have light patches in some parts.—These are called “friars;” they are caused either by imperfect distribution of the ink on the table, or by insufficient rolling of the forme.

The proof may have black patches in some parts.—These are called “monks,” and are caused also by improper distributing and rolling, but they result from having too much ink. Distributing the roller well on the ink table may cure this evil.

Some of the letters may not print with ink at all, but only leave a blank impression.—They have missed rolling, most probably because the forme is damp. Observe whether the dampness proceeds from the forme or the table, and remove it.

Some of the letters may be “filled up,” and print altogether black.—These are called “picks;” they are caused by dirt on the forme or on the roller; in either case, perhaps, proceeding from dirt on the table. Get a pin and carefully, without injuring the face of the type, pick out the bits of dirt, or rub the part with the brush made for this purpose, called a “pick brush.” If this is not effectual, the only remedy is to “lift the forme” (*i.e.*, to remove it from the press) and wash it over.

The letters may print double.—This is caused by a “slur.” It may be that the platen has been pulled down before the carriage stopped. But the defect may indicate a more serious evil. The platen may not be rigid, being hung too loosely. Ascertain if you can shake it or move it from side to side. It ought to be entirely free from lateral motion. Get a screw-key and try if the different screws connecting the platen with the piston are all equally tight. Do not screw one up more than another, or you will spoil the impression, but have everything tight and fast. Or the

tympan may be loose. If so, tighten up the two screws which form the hinges and connect it with the carriage. This part of the press, too, should be entirely free from lateral movement. If, notwithstanding all these precautions, there is still a slur, it may be because one or more of the platen screws is cracked; if this is so, replace with a fresh screw.

The bottom lines may be smudged.—The platen has been brought down too soon, and rubbed over the lines as they have been moving on the press.

There may be creases in the paper, and open ridges which have not been printed.—The paper has been badly laid, and been too baggy. Lay the next sheet flat and square, and this will not occur again.

One half, perhaps, only of each letter prints; the type looks as if it had got on one side.—It has got “off its feet,” and if you examine it, instead of the top of the letters forming a straight line, they look as though they were the teeth of a saw. The only remedy is to unlock the forme and try to set them on their feet again. It is the result of carelessness in locking up, and should be rectified by the compositor.

Now turn the paper on its back and examine it in a good light, observing carefully the defects of impression.

The “pull” may be very heavy, the letters seeming disposed to run through the paper.—Take off some of the impression by turning the impression screw or adjusting the wedge on the chill, according to the construction of the press.

The impression may be too heavy in parts.—This may arise from a variety of causes. There may be dirt or paper underneath the forme; if so, lift it. There may be dirt on the tympan, and to find this out you will have to take off the tympan sheet. A very heavy ridge of unnecessary pressure shows that the blanket has got crumpled. Open the tympan and smooth it out.

The bottom of the forme may have got too much impression

and the top little or none, and vice versâ.—This may arise from two causes: (1) The platen may not have been properly hung, and is not parallel to the table. Get a spirit level and try it; any “hanging” at either side may be obviated by turning the screws of the piston. Or (2) the carriage may have been run in too far, or not far enough. This defect often occurs on old presses. It can easily be discovered, and by care easily remedied. For this and many other reasons we advise the beginner to practise on a press in good working order, and with proper tympan and packing.

Some of the lines may be heavily printed, and others only lightly.—The cause of this may be two-fold. All types are not the same height to paper, and types even of the same height when new get lower by use, the rubbing on the imposing stone reducing their altitude. The longer any kind of type is used the more worn, of course, it becomes, and this wear naturally reduces the height. This is the most common evil with which the pressman has to contend, and is the most difficult to obviate. It opens up the subject of making ready.

Correcting on the Press.—Leaving the point for the moment, we may remark that now is the time to have the proof passed, and if there are any corrections to be made in the forme, they should be done now. We will suppose that the correction, appertaining as it does to compositors’ work, has been done, and the forme carefully locked up again. See that it has not shifted, but corresponds with the lines marked round it. Be sure that there are no odd letters left on the chase or in the furniture. The roller will certainly pick these up, probably deposit them on the forme, and then a batter will be caused.

Making Ready.—Having got everything right again, pull another proof and begin to “make ready”—that is, get the impression equal and level over the whole of the forme.

Now, it is obvious that if we have lines of different heights

and it is necessary that all of them should receive the same amount of impression, there are two ways of working—the low lines must be raised by putting something under them, or something must be done to press the paper down to them. The one mode is called “underlaying” and the other “overlaying.”

In *underlaying* we put a piece of paper, or even, perhaps, thin cardboard, *under* the type; in *overlaying* we put the same upon the tympan sheet. Either will correct the inequality.

Whenever practicable, underlaying is to be preferred to overlaying. Because, even if by overlaying we get an equal impression, we do not get as good inking. The part that is low more or less escapes the roller, and loses its proper supply of ink. But underlaying is both troublesome and dangerous. It involves lifting the forme each time it is done, and in lifting letters may drop out and accidents be caused.

Overlaying is by far the readiest plan. It is done in this way. Get a making-ready board. This is an ordinary drawing board of suitable size, and is used in any part of the press-room found convenient; *e.g.*, it may be supported on the bank or on a window ledge. Pull an impression on a thin sheet of paper without inking the type. Place the sheet with the reverse side upwards on the making-ready board. Then cut out the parts that are embossed, and place pieces of thin paper over the parts that are light, pasting them carefully on the exact places on the tympan sheet where they fall. One piece of paper may not be sufficient, and others may have to be pasted on. Proceed very carefully; do not put too much on at first, but gradually build up your overlays, from time to time pulling an impression on a sheet of common paper to judge of the effect. Practice and experience will gradually enable the young pressman to do this expeditiously; at first he must have patience, and get the forme into working order by slow degrees.

Be careful to cut the overlays of the exact size required. If they extend beyond the part required they will entirely neutralise the effect. Paste them carefully all over, and use as little paste as you can ; a thick layer of paste in one part and a thin one in another must give only bad results. These cautions are applicable also to underlays. A good, hard paper is the best for the purpose ; soft, spongy paper soon gets flattened out, and the work has to be done over again.

Old type and a bad tympan tax the resources and often exhaust the patience of the best pressmen. They, however, soon acquire a very quick method of patching a tympan sheet. They put a little paste on the back of the left hand, and in that hand hold a piece of paper. They then go over the proof from one end to the other, tearing off as much as may be required for each place, pasting it by one finger of the right hand, and sticking it on with another—all being done with remarkable rapidity. This speed, however, the tyro must not attempt.

When the overlaying has been done to the satisfaction of the pressman, he should paste a thin piece of hard paper over the overlaid sheet, which has been fastened on the tympan. This is to prevent the overlays getting moved, and to make it more comfortable to lay on the sheets.

Now pull another sheet ; see whether it is satisfactory in all respects. A good impression should be sharp and clear throughout ; free from monks, friars, or picks. The pull should be light, only just sufficient to “bring up” the types.

If it be found that the types will not come up without a heavier pull than is desirable, open the tympan and put some sheets of paper in besides the blanket or other packing already in. Before commencing to print the pile of white paper, the job should be got perfectly ready, and a copy passed by the overseer.

The Use of the Frisket.—If the quarto bill we have been considering had to be printed on a sheet of paper which

would have large margins, these margins would "dip," that is, fall on the furniture, at least on two sides where there were no pins to keep them up. They would, consequently, get "blackened" (inked), as, however careful the rolling may be, some ink will get on the furniture. The frisket, reference to which has already been made,¹ is the appliance for preventing this "blackening" of the sheets. It is covered with stout paper; out of the paper is cut a hole or holes, corresponding with the page of matter which is to be printed. When, therefore, the frisket is folded down on the tympan it forms a sort of mask for the sheet; that is to say, it intervenes between the sheet and the forme, those parts of the forme which are to be printed on being alone exposed, while the other parts are covered, and are, therefore, completely protected from being soiled. Cords or elastic bands may in some instances be used instead of paper; they do not (as the paper frisket does) cover up the margins, but they keep the sheet closer to the tympan; they should be stretched transversely from side to side, so as to give the necessary support to the blank portion of the paper to be printed, and yet to prevent it encountering the face of the type.

An experienced pressman manages to bring down the frisket and the tympan by one continuous motion. He does not first fold down the frisket on the tympan, and then fold the two together over the forme, but by a circular motion gets the frisket down in such a position that while holding it by the ear he can just catch the frame of the tympan, and then he holds the two together. This is called "flying the frisket," but it is difficult to describe in words.

The frisket is not used in all jobs, but only where it is deemed desirable, having regard to blanks and margins. Its frame is easily detachable from the tympan, and replaced at pleasure by means of the appliance on which it hinges.

CHAPTER LX.

PRINTING WITH THE HAND PRESS (*continued*).—Bookwork at Press—
Registering—Miscellaneous Hints and Cautions—Payment for
Press Work.

Bookwork.—No one now thinks of printing anything but short jobs on the hand press, but as some of these may be in the form of books, *i.e.*, in pages which have to back one another, we will describe the duties of the pressman with regard to them.

The pressman should not take for granted that the compositor has properly performed his duty with regard to the making up of the forme. After seeing that it is clean and well locked up,¹ he should observe whether the pages have been properly imposed, whether they are square one with another, and whether they line one with another. For these purposes a steel straight-edge and T-square may be useful. If he finds anything wrong he should immediately communicate with the compositor, who should rectify the error, either on the press or on removing the forme to the imposing stone. Want of these precautions on the part of a pressman sometimes leads to a great waste of time; for a forme may be “made ready” and then have to be altered after all, the first making ready being useless.

In laying a book forme on the bed of the press, be careful to place it the right side on. If the forme be 12mo, the signature should be on the right hand; if folio, 4to, or 8vo, the signature should be on the left hand.

¹ Consult pages 212 and 303.
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Be very particular in marking round and fastening the forme, and in packing the tympan, whether with blanket or paper. Paper or cardboard is best for new type ; but if the type be old and worn, a blanket is most serviceable.

As regards the tympan sheet, the forme being in several pages, the procedure is rather more complicated. We will suppose it is a quarto forme ; the first thing to be done is to fold a sheet of the paper in quarto. Lay the long crease upon the middle of the long cross of the chase, and the short crease over the middle of the grooves of the short cross. Then turn down the tympan, and pull as directed on pages 671 and 672.

Turn up the tympan again, and see whether the sheet be laid even ; if it has not been laid even on the forme, it is better to relay it and pull it again. It is of great importance that this tympan sheet should be laid on even and square ; then paste the corners as already directed.

Registering.—Each sheet of paper will have to be printed on both sides, first from one forme and then from another (unless the forme be a half-sheet forme,¹ when, on the paper being turned, it will back itself). It will have to be laid on the press the second time in such a manner that the pages on the second side exactly back those on the first. To ensure this, points should be used.

Take a pair of the kind suitable to the forme,² screw them to the grooves in the tympan frame, placing them so that the spurs will fall in the grooves of the cross of the chase. Points should be placed at unequal distances from the edges of the sheet, for by placing the point on the off side so that the hole is made nearer the middle of the paper, the pressman, when perfecting the sheets, is not compelled to reach an unnecessary distance ; and if any of the sheets should

¹ Consult page 249. Half-sheet work is by pressmen and machine minders often called "work and turn."

² Refer to page 661.

have been turned round while the first forme was being printed, it will be detected by the spurs not fitting into the holes. For a forme of folio, 4to, or 8vo, the off point should be placed further into the paper than the near point ; but for a forme of twelves the points should be placed equidistant from both edges of the paper.

To prove the register, a sheet should be laid on and pulled ; it should then be turned (if 4to or 8vo, etc., end over end ; if 12mo, edge over edge) and placed on the spurs of the points, so that they may pass through the holes previously made, and the sheet should be pulled again. If the points have been placed perfectly in the centre, and the furniture of the forme is true, the register should be correct. If the register is out at the sides of the pages, it should be remedied by the points being moved a little up or down, as circumstances may require ; if out at the heads, by a lead being inserted or taken out at the cross.

The spurs of the points should be as fine as possible, and ragged point-holes should be avoided. A pin should be inserted at the bottom of the tympan sheet, and two at the off side. In all cases the register should be made perfect before the work is proceeded with.

Points should be used whenever the sheets have to pass more than once through the press, as, for instance, in work in two or more colours. In this class of work accurate register, to a hair's breadth, is of great importance. In colour work, points with two, three, and even more spurs are sometimes used.

Preparing the Frisket.—The frisket, having been previously covered with paper, pasted on to its frame, should now be screwed on to the tympan frame. The forme should be inked, a slight impression pulled on to the covering of the frisket, and the whole of the impression of each page cut out, so that no part of the frisket will come on the pages while printing. Cut the pages or marked parts out, making the holes a little, say one-eighth of an inch all round, larger

than the type, so as to prevent the frisket "biting" the impression, *i.e.*, taking part of the impression which should go on the sheet of paper. As the frisket sheet will be greatly weakened by the pieces being cut out, it may be necessary to strengthen it. This may be done by placing tape over the parts that are left. Fasten the tape to the frame at one side, bring it along the sheet and round the other side, ending it at the place where it commenced. Then melt a little roller composition and fasten the sheet and the tape together here and there, to prevent "bagging," and the whole will be strong enough to begin working.

In order to prevent the sheet touching the type before the platen comes down, it is well to use bearers on the frisket; bits of cork answer the purpose if they are of adequate height and so fastened to the frisket that when the frisket and tympan are turned down on to the forme they fall on the backs and gutters or outer margins.

Whenever there are large blanks in the forme, ordinary bearers, such as are described on p. 663, should be used. Frisket bearers must not be too many in number or they will impede the working.

In bookwork two things must always be kept in view—the inking of every forme must be even, and the impression taken from every forme must be even too, so that when the book is bound it appears to the reader as if all printed at one time, no page having more or less impression, or more or less ink, than another. This applies to work at machine as well as at press.

When the first forme of a sheet has been printed off, the place occupied by the chase on the carriage should be marked with a piece of lead, so that the second forme, when laid on the press, may be adjusted by the mark.

Set off.—When printing the second forme, or "perfecting the sheet," as it is called,¹ the pressman should occasionally

¹ This is also called "reiteration."

examine the first side to see that the pressure of the second working is not causing a "set off," *i.e.*, is not causing some of the ink on the first side to come off and be deposited on the tympan sheet. Should there be any appearance of this, a thin sheet of paper over which glycerine, benzine, oil, or turpentine has been lightly rubbed should be pasted at the corners, and the tympan sheet covered with it, the edges being passed under the points. This set-off sheet should be removed and a fresh one substituted as often as necessary.

General Hints and Cautions.—*Cleanliness.*—Keep your press in good order. The parts intended to be bright should be kept bright. An occasional rub with a greasy rag will keep both polished iron and brass bright, and without any great labour or waste of time. In some offices the dull parts are painted occasionally with Brunswick black, which gives the press a smart appearance. Never allow any brickdust about a press; some of it is sure to get into the working parts and do damage.

In badly-managed offices the tills of the platen—that is, the spaces between the strengthening ridges—are generally filled with pie, broken leads, quoins, and dirt, the whole saturated with oil. This is simply disgusting; these places were never intended as receptacles for such stuff. It ought to be a rule to keep the tills perfectly clear of everything, except it may be a bearer or two, or a bodkin, or something directly appertaining to the press.

The platen of a press should be occasionally scraped with an old piece of rule, as dirt is apt to accumulate underneath from the tympan. If this be allowed to remain it acts something like an overlay, and effectually prevents a good even impression being obtained.

Oiling.—Always keep your press well oiled. This not only tends to the minimising of wear and tear of the press itself, but saves a vast amount of labour to the workman. See that the ribs are well supplied, but do not have them

running over with oil. Then put some in at the head, to lubricate the chill and the working parts in the head. The chill has but a casing or facing of steel, and if it be not well oiled this casing wears off and the chill must be recased. When properly adjusted and oiled, the arm ought to fly back, if pulled home and suddenly released. Instantly stop any "creaking;" find out the place whence the noise proceeds, and apply some oil.

Too much oil, especially if bad, as most cheap oils are, is nearly as mischievous as too little. A press that is clogged up with oil and impurities is both unpleasant and laborious to work. Paraffin oil is a good solvent of most of the ordinary lubricating oils; a little run into the ribs will often quickly clear them of a variety of old-standing filthiness.

Inking.—Rolling is equal in importance to any of the pressman's duties, and if not performed properly all the care bestowed upon other operations is completely wasted.

If the ink has stood long on the ink table since it was last brayed out, the surface of it will be found generally to be dried and hardened into a film or skin. Carefully take off this film before you disturb the body of the ink; for should any—if ever so little—mingle with the ink, when the roller happens to take up the small particles of film and deliver them again upon the face of the letter, they produce picks, print black, and deface the work. If they get between the faces of two or more letters, or the hollows of them, they will obliterate all they cover. If they be pulled upon, and the pressman is not careful to look over his work, they may run through the whole heap.

A careful man will never take too much ink at one time, but keep a small quantity brayed out that he may be certain of not taking more on the roller than is necessary.

The moment the tympan is up the roller should be applied to the forme, beginning at the bottom and going on steadily to the top, then returning. The roller should not go beyond

the type matter, or it will sink into the furniture and blacken the sheet if unprotected there.

It is impossible to lay down a rule for taking ink. All depends on the nature of the particular job and the quality of the ink. A forme of large type might require the taking of ink for every sheet; some work every two sheets; light formes every three or four sheets. Very fine work, again, might require ink every sheet to keep the colour of each perfectly alike.

All the time when he is not engaged inking the forme or straightening the heap of paper, the pressman who is rolling should be distributing. That is one of the secrets of good presswork. It is the duty of this man to look after the due inking of the forme and to watch the colour—*i.e.*, to see that just the proper quantity of ink is applied each time. However, if the man at the forme observes that more or less ink is required he should immediately tell the other.

In most work it is well at the outset to select one sheet, and to keep that out as a standard by which to regulate the colour of the whole. The eye is very apt gradually to get accustomed to a pale colour, and when a late sheet is put beside an early one for comparison the difference is often very striking.

While the roller is taking ink, the puller should employ the time in looking over the heap, to detect any want of uniformity in the colour; to observe if any letters, quadrats, or furniture rise; that no letters are drawn out or battered; that the register be good, and the work free from picks. When two men are working at press, one pulling and the other rolling, it is usual for them occasionally to "take turns," and alternate their occupation. Hence it is necessary for each to understand the whole routine.

Pulling.—If you work with a frisket—but avoid the necessity for one whenever possible—beware of its falling suddenly and battering the type.

The puller should habituate himself to glance his eye over every sheet as he takes it off the tympan. This may be done without retarding his progress. In this way he will be enabled to detect imperfections which may escape notice otherwise.

Creases and *wrinkles* will often happen in the sheets through careless wetting of the paper; these should be carefully removed by smoothing them out with the back of the nails of the right hand.

Slurring and *mackling* frequently happen when the tympan is carelessly and suddenly put on the forme. It should always be put down easily and quietly.

If the tympan is out of order and rubs against the platen, a slur or mackle will inevitably be caused. This can easily be remedied by moving the tympan joints so as to clear the platen.

Loose tympan at all times slur the work; great care must therefore be taken in drawing them perfectly tight.

Doubling of the impression is often caused by slack or rickety platens. Wetted paper becoming too dry will also sometimes cause the impression to mackle.

A fissure in one or more of the platen bolts may be the cause of slurring, even though the crack need a magnifying glass to discover it, for, when the strain comes, it widens; when this is the case a new bolt should be substituted, and, till it can be obtained, the press should be worked on two bolts, one at each corner of the piston, taking it diagonally.

Independently of the above causes, slurring and mackling will sometimes happen from causes which baffle all art and patience to detect. It will be better in such cases to tie as many cords as possible across the frisket, which will keep the sheet close to the tympan.

Set off.—When working the second side of a job, great care should be taken that it does not “set off.” The instructions on p. 687 should be followed.

Miscellaneous.—Although it is the duty of the man who rolls to keep the heap of paper straight, it should be the aim of the pressman to lay the sheets as evenly as possible as he takes them off the tympan.

If a block or plate is low to paper, underlay it as directed in the next chapter: do not attempt to bring it up by overlaying.

Always put the overlays inside the tympan.

It is much better to get the overlaying done once for all before actually beginning the job, than to commence with that work only half done, and then to stop every dozen sheets or so to potter with obvious imperfections. On the other hand, however confident you may be as to the efficiency of your work, keep watching the sheets as you take them off.

If picks, produced by bits of paper, skin or films of ink, grease, or other filth, get into the forme, they are removed with the point of a needle or pin; but if the forme is much clogged with them it should be well brushed over with clean lye, or taken off and washed in the lye trough. In the first case, before the pressman goes on again, it should be made perfectly dry by pulling a waste sheet or two, in order to suck up the water deposited in the cavities of the letter; in the latter, it must stand some time to drain and dry before he again lays it upon the press. Benzoline will often remove picks, and it has the advantage that it evaporates almost immediately.

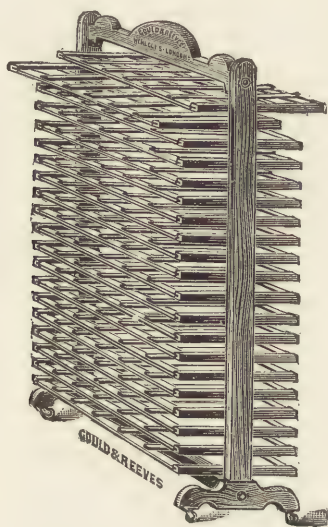
Torn or stained sheets met with in the course of the work must be thrown under the bank; but the pressman should be careful to have them replaced by others from the warehouseman.

Nearly every office now possesses a cutting machine, but paper is sometimes given out to be worked that has one or two edges cut by hand with a knife. Whenever possible, lay the sheet to the edge trimmed by the machine.

To ascertain whether a piece of paper is cut straight—that is, to the shape of a perfect rectangle—double it up diagonally, and, if the sides coincide, it is correct, but if not, the inaccuracy will be immediately apparent.

If the sheet is crooked, work to the top and left-hand side. The other sides may be trimmed afterwards.

Drying the Sheets.—The paper being all printed, it must



DRYING RACK.

be exposed to the atmosphere a sufficient length of time to let the ink set firmly.

When dry paper and quick drying ink are used, the exposure each sheet gets on the heap before the next is placed on it is generally sufficient; but if the forme is solid, the sheets may well be placed for a time on a drying rack, one form of which is shown in the annexed illustration.

When sheets were worked wet they had to be hung on

poles placed at short intervals across a room, or passed through a hot rolling machine (see *post*, Warehouse Department).

Payment for Presswork used to be made by the "token" and "hour." The token consists of 250 sheets; each token in ordinary work is reckoned an hour, and it is equally correct to say that a forme is so many tokens or so many hours. Thus, 1,000 is four tokens or four hours one side, eight hours or eight tokens perfect, and the price for this is so many tokens for each man.

CHAPTER LXI.

THE BRINGING UP OF CUTS AND OTHER BLOCKS.—Underlaying— Overlaying.

BEFORE proceeding to the consideration of printing with machines, we will deal with the subject of the bringing up of cuts and other blocks, because the principles on which this is done and the modes of doing it are the same whether the impressions are to be taken with the hand press or with any of the various kinds of machines. This "bringing up" is achieved by making use of the systems of overlaying and underlaying already referred to in general terms.¹ Neither of them, it is true, is exclusively confined to the printing of blocks, for there are occasions where types, and especially wood types, have to be treated by one or other or even both of these processes; but woodcuts and process blocks can hardly be printed at all with any semblance of success without recourse to both. In the case of wood engravings, it is not often that the pressman has to print from the originals, though these are usually executed on wood deemed to be type high. Electrotypes are so cheap and so quickly produced that the owner of an original cut seldom risks the injury it may sustain if it is allowed to constitute part of a forme. Fresh electrotypes can be taken from the original as often as required, and if this is carefully preserved, those last taken are no worse than the first. They are usually thin faces of copper backed with lead slightly hardened with

¹ At page 654.
(694)

antimony and mounted either on type metal or more usually on wood until they are type high.

Levelling Blocks.—It seldom happens that the woodcuts or electrotypes to be printed from are the same height throughout, or that they are exactly type high. Sometimes they are too high, and if this is the case to any appreciable extent, it is best to reduce them by planing them at the back; more frequently they are low to paper, either wholly or in part, and when so they have to be treated differently according to circumstances.

Underlaying.—If a block is uniformly low, one or more sheets of hard paper or card are to be pasted all over the bottom of the block to raise it to the required height. If it is type high at one side and low at the other, we have to arrange the underlay so that it is thickest at the low edge, and is gradually thinned off towards the other side. Suppose, however, it is type high at both sides, but low in the middle, we must rub it down with glass paper till the block is level all over, and then make it type high by pasting card or paper on it.

A delicate little machine has recently been brought out to show exactly the inequalities or deficiencies in height of blocks. It is called the Micro-Underlay Gauge, and it is very useful when fine process blocks are to be used with the best results.

When original woodcuts are used, or when the electrotypes supplied are mounted solid, it is obvious that the underlays must be pasted at the bottom of the cuts or mounts; but when the electrotypes are mounted on wood the metal may be severed from the wood, the pins or screws being withdrawn, and the underlays placed between, the metal being fastened down again as before. If their lowness to paper is quite uniform the former plan may well be adopted, and even when the defects are of the other kinds mentioned we may pursue it if time and expense are

of primary importance ; but it is best workmanship to remove the plate and paste paper upon the back of it in such places and in such degrees as are requisite, and then refasten the screws or pins.

Of course, blocks requiring treatment as above have to be removed from the forme for it.

When the mount of an electro or an original wood block is underlaid, it is best, M. Motteroz says, to put paste on the underlay only at the four corners of the cut, unless it be very large ; for, otherwise, wetting may cause the paste to swell, and the underlay will thicken where thickness is not wanted.

The main objects of underlaying are, first, to bring the block up to the level of the surrounding type matter in the forme, so that when the inking rollers pass over it they will impart to it its proper quantum of ink, which they certainly would not were it to remain low to paper ; and, secondly, to ensure an even impression.

But underlaying is not confined to these objects. We stated in Chap. LVII. that where a block was most solid there most pressure was required, and this may largely be obtained by underlays as well as by overlays. Therefore when a plate is removed from its mount and the block contains great contrasts of light and shade, a good pressman will take care that just under the solid parts there is a little extra underlaying : indeed an American printer, celebrated for the excellence of his prints from half-tone process blocks, stated in the *Inland Printer* recently that his practice is to underlay his blocks with various thicknesses of paper—often as many as four—almost in exactly the same manner as overlays are made as hereinafter stated.

When there are several blocks in a forme, those that are low must be brought up to the height of the highest, unless, indeed, this last is more than type high, when it must be rubbed down with a file or glass paper.

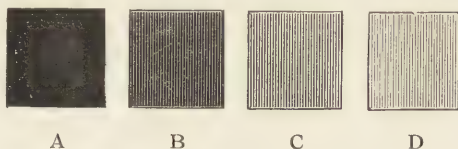
If the blocks have already traces of underlays under their mounts, these must always be carefully cleaned off before the work of underlaying is begun.

Use hard paper or cardboard for underlaying, the harder the better. Soft paper will not yield a satisfactory result. When a block is underlaid under the mount, the use of several layers of paper is to be deprecated; it is much better to use thicker paper or card or even millboard.

Some printers prefer glue to paste for the affixing of underlays, and they spread it thinly over the whole surface.

Blocks should never be underlaid so much as to render them more than type high: the exact height of the types is what is to be aimed at.

Overlays.—The theory of overlaying has been well explained by Mr. De Vinne. He uses the following diagram,



and says: "Suppose A B C D be separate hand stamps engraved on wood. If the surface of the stamp marked D were inked, the moderate pressure of ten pounds would transfer these thin lines to paper. C, having more lines, and offering more resistance, would call for a pressure of twenty pounds or more to ensure a good print. B is still blacker, and resists much more, requiring say fifty pounds to force it fairly. A, which is entirely black, could not be smoothly printed with a pressure of less than one hundred pounds—perhaps more. If the pressure of ten pounds were put on each square, B and C would show weak and ragged lines, while A would be blotched all over with irregular grey spots. If the pressure were made one hundred pounds or more, the lines of B and C would be hard and muddy, and

D would be worn out before one hundred impressions had been taken.

“Overlaying is merely an intelligent adjustment of pressure on woodcuts—a pressure adjusted to suit the resistance, so that light lines shall have little, and solid surfaces much, pressure. So treated, light lines will print sharp and clear; the compact and closer lines of middle tints will be smoothly grey, and the solid portions of the dark shadows will be full velvety black. The different degrees of light and shade in every woodcut require this graduation of pressure. The theory seems simple enough, but putting the theory in practice is not. Every printing machine is made so that the pressed and the pressing surfaces shall be in exact parallel—so that pressure shall be absolutely uniform in every part. If woodcuts were like the ordinary text-types of books and newspapers in their equality of colour and their equal resistance to impression, there would be no need of overlaying; no more pressure would be required in one portion than in another. But woodcuts are conspicuously unequal—the thin lines, the close lines, the solid blacks, are irregularly combined. Yet each must have a different degree of pressure. On simple diagrams, like A, B, C, and D, the result desired can be reached by pasting one or more thicknesses of paper over C, two thicknesses over B, and three or four over A. Adding thickness to the pressing surface gives the additional pressure. On a woodcut in which light and shade are intermixed the work is extremely difficult—not to be explained by words; to be learned only by experiment and the study of repeated failures. The rarity of well-printed and the commonness of badly-printed woodcuts are indications of the difficulty of the art.”

Names of Parts of Engravings.—The different parts of engravings are known by different names.

The lines forming sea and clouds are called *tints*, and are either “light” or “heavy;” they are cut with a tint tool.

If a landscape were being described, the lines of the road-way, cottage, and foreground would be called *shades* of various gradations of "colour."

Where tints and shades are soft, or white is introduced, they are called *lights*.

The solid portions, or those without tints on or in them, are called *solids*.

That portion of the block which is below the printing surface is called the *field* of the block.

Making Overlays.—Have before you, if you can get it, the engraver's or blockmaker's proof. This will show you how the block should look when it is printed, and you should strive to produce the same effects.

Now, having properly levelled and underlaid your block, pull on a press good proofs of it on four pieces of paper of the following sorts and thicknesses:—

1. One on, say, 24 lb. printing demy (20 lb. would be better if you were going to cut any overlay for the first time, as, if any errors were made in cutting, it would not matter quite so much).

2 and 3. Two impressions on thin paper, about the thickness of bank post. If bank post be used (and it is excellent for the purpose), the softer machine-made cream wove, with smooth surface on both sides, should be selected in preference to hard hand-made paper.

4. One impression on the same class and thickness of paper as 2 and 3, but a 23 lb. small post engine-sized printing paper is most suitable, it being neither too hard nor too soft for the purpose.

All these impressions should, as far as practicable, show every detail of the block, but should be pulled with as little ink on as possible.

These four impressions are known in some printing offices by different names appropriate to the purposes to which they are to be put in the making of the overlay. The first

is the "first general," the second the "solids," the third the "solids and shades" or "heavy tints," and the fourth the "outer general."

Now take your making-ready board, described on page 680, and fasten to it with pins the engraver's proof (if you have it) and the first general overlay, the first of the four impressions. Study the engraving carefully; you will probably find there are four degrees of darkness in it corresponding more or less to the diagrams A, B, C, and D on page 697. Take a sharp penknife and from the impression you have on the board cut out all the lightest parts, removing all white or plain paper, and the lights and hard edges when necessary. Cut the edges of solid portions, or of heavy shades or tints, with a slanting cut to the thickness of a thick lead, or, if necessary, more; in the latter case shave or graduate the edge to the extent of a nonpareil to prevent the cutting away acting too abruptly. Having done this, cut round the outer edges of the impression till the whole impression of the block will drop out. The first general overlay is complete; place it in front of you on the board.

Now take one of the sheets of bank post and cut out to the exact size all solids, and as each is cut out paste it over the corresponding portion in the first general. If these parts are very small they can be cut out in sets, as much as possible of the tint work being cut away.

Take the second sheet of bank post and cut out the solids and the heavy tints, and paste them over the solids on the first general.

The fourth sheet, or outer general, only requires to have the impression carefully cut out, and the white or plain paper cut away or removed from it.

Before pasting this fourth impression over the others fit it carefully over them, and having got it to fit exactly over the first general, with the solids and solids and shades pasted on it, hold the bottom half firmly with the fingers,

slightly paste the top half here and there and rub it down. Then serve the bottom half the same way. Put a stout piece of clean paper over it, or place the overlay between two cards and rub down. Its component parts will then adhere well, but it must be put under a weight, so that when dry it will be perfectly flat and keep its shape.

For overlays in which the solids are well defined three sheets or impressions may be sufficient, but the paper used should be 23 lb. or 24 lb. small post for the two generals and a calendered 20 lb. demy for the solids.

In making overlays the following points are most important :—

- (a) Use great exactness in cutting.
- (b) Use the same exactness in pasting one overlay over another.
- (c) Do not shave the edges more than is necessary.
- (d) Do not leave any white paper on the edges.
- (e) Do not cut away any portion of the solid parts of the engraving.
- (f) Do not use too much paste, or paste that is too thick.
- (g) Do not stretch the sheets so that they do not fit one over the other. The cause of stretching is either the use of too much paste or the knife not being sharp, whereby a strain is put on the paper when cutting.
- (h) Do not use scissors.

When you have done all you think necessary in the making of your overlay, let it dry as long as you can, and then paste it very carefully on the packing exactly where this will take the impression of the block. To find out the place you must take an impression from the forme on the packing itself. You must adjust the overlay with great nicety, or all your labour will be wasted—the heavy pressure will come where light is wanted, and *vice versâ*. This must not be.

The overlays being thus placed in position, take a sheet

of tough tissue paper the size of the forme, and fasten it to the "make-ready" in such a manner as to cover and protect them.

When practicable, overlays should be made several hours at least before they are wanted for use ; for they harden as they dry, and work better, there being more firmness in them than when they are new, wet, and soft. Besides this, the pieces are apt to slip about in a new overlay, under pressure, and to destroy the usefulness of the appliance altogether.

If a heavy forme of engravings is to be dealt with, it will save much time if four pulls of each block are taken on a press, and these are put in the hands of the pressman or machine minder while the compositors are at work on the forme. He can thus make his overlays while the forme is being composed, and when the latter reaches him, he will only have to put the overlays in their correct positions on the packing.

Not more than one of the impressions should be quite full of colour, as too much ink hides the work and makes your fingers uncomfortably dirty as well. Try to keep the hands clean while making overlays ; you then feel better fitted for doing a delicate task, and, generally speaking, manage to get through it better.

When hard packing is used, overlays have to be thinner than when it is soft. Some men use remarkably thin paper for their overlays, and others equally skilful use very hard plate paper for part of the overlay. The latter, though, is apt to spread under the impression, and it is more easily compressible than the paper already referred to. For colour work the overlays are usually rather thicker than for black.

After a forme has been worked, the overlays may be preserved to do duty again should the cuts ever have to be reprinted. When old overlays that have been used several

times have to do duty again, it is as well to roughly make up an overlay three or four pieces thick and put it under them, as it tends to give the necessary pressure, and the work of the overlay is retained next the cuts.

After the overlays are up, and a fair sheet out, what more they require should be done on thin paper pulled dry.

Remember that all labour in overlaying is thrown away unless the packing is perfectly smooth and even.

Substitutes for Cut out Overlays.—Of late years experiments have been made, chiefly in the United States, with a view to finding substitutes for the ordinary overlays so as to enable pressmen to begin printing off earlier than is now possible. The new methods are known as the Gelatine relief process, the Plastic process, and the Emery-flour process. None of them have come into general use, but the modern printer ought to know what they are.

The following descriptions are condensed from an article by Mr. W. J. Kelly which appeared recently in the *American Pressman*.

Gelatine relief is obtained by the application of a pasty liquid, made of one ounce of white shellac dissolved in two ounces of methylated spirits of wine, which may be reduced to proper consistency by the addition of two ounces of naphtha. Two days is necessary to effect dissolution of the shellac. The manner of applying this gelatine is with a soft hair brush. It is employed to build up the stronger lines shown in an engraving or broken lines of type. In the hands of an accomplished workman speed and fair results are obtainable. It is specially adapted for short editions of ordinary work.

The Plastic process has not been received with much favour. The materials employed in making the composition vary; some using the ordinary embossing compounds, some powdered shellac, others fullers' clay, etc., with suitable adhesive solvents and adhesives. An impression of the engraving is taken in the composition so formed, after which it is hardened by careful baking, and, after being trimmed of all surplus portions, is applied to the tympan in the usual overlay manner. It has this advantage over those to be named hereafter, that it can be amended by taking from and adding to portions of an illustration where such treatment may become necessary. In addition to this, the toning of vignetted edgings is one of its best features, as the plastic mould furnishes good facilities for cutting down and scraping away edges that show too strongly on the printed sample. The

plastic composition is thinly and evenly laid on sheets of thin manila paper, and the face of the engraving oiled to permit of the material lifting smoothly from the engraved plate after pressure on the press.

The Emery-flour process or "Beck Process" involves the use of powdered emery, shellac, and quick-drying adhesive ink or sizing. The cut is rolled up with ink into which a fairly strong varnish has been worked. A sufficient quantity of ink is used to bring out the subject of the engraving, four or more impressions are struck off, and these are separately and carefully covered over with the powdered material and then left to dry, care being taken that the powder is not rubbed off or scratched on the face before being thoroughly dry. Usually, four sheets of paper are necessary for one overlay; these are trimmed at the corners of the several sheets, and then fastened together so as to register over each other in a perfect manner; after this preparation the overlay is applied to the tympan in the same way as a cut-out overlay. The solids or strong tones naturally take up more ink than the high-lights, and thereby accumulate a greater quantity of the powdered material, and thus build up varying degrees of strength in the overlay. This process of overlaying cuts has its chief advantage in speed, but only in certain cases. It cannot be properly adapted for vignetting, nor for the better class of illustrated work, nor indeed for fine mechanical detail; because if any part of the proofs taken from the engraving (made for receiving the powdered covering) has not been rightly secured, or from any cause the powder becomes disengaged from the proof sheets (overlay sheets) either before or after being fastened on to the press, there will necessarily occur defects in the overlay and in the printed product. In other words, the printed work will appear "scabby" in spots—particularly so in half-tone illustrations.

CHAPTER LXII.

MACHINE PRINTING.—Difference between it and Hand Press Work.

THE great difference between printing with the hand press and printing with a machine is that in the former the hands of the workmen guide, if they do not actually effect, every stage of the operation; while in the latter, when once the machine is prepared, almost the only manual operation is the feeding in of the sheets of paper. The great thing, therefore, is to see to the preparation of the machine in all details—to have everything in perfect order before the work commences, to watch carefully that it remains so throughout, and to effect the changes that may be necessary for counteracting any tendency to deterioration.

We have already¹ pointed out the difference between the inking arrangements of the hand press and those of the machine. In the former there is but one roller, which, in the hands of a skilful pressman, serves as vibrator (or imparter of ink to the table), distributor, and inker. In the machine it is necessary to have a reservoir (duct) for the ink, with special means of regulating the flow from it, and rollers mechanically imparting the ink to the table, distributing, and inking; and, inasmuch as the forme must be duly inked for each impression (which in ordinary machines is once every three seconds), it is obvious that one roller to distribute and ink will not be enough; there must be two,

¹ At pages 564 *et seq.*

three, or more—in fact, within reasonable limits, the more the rollers the more perfect the inking.

The ink-duct in almost all machines is similar to that described on page 565. The knife is capable of being adjusted to the cylinder revolving in it (or ductor) with great nicety, by means of the set screws which are placed all along it. Some of these hold back the knife, others press it forward, so that between them there is no chance of its slipping. These regulate the thickness of the coating of ink which is laid on the ductor each time it moves. That motion is regulated variously in different machines, mechanism being provided for turning the ductor more or less of a complete revolution at each travel of the bed. In machines having the ratchet and pawl movement it can be regulated by moving the pawl closer to or farther from the centre of the wheel which drives it. By these means, more or less of the duct cylinder, at the will of the machine minder, gets coated with ink at each revolution of the machine, and while the vibrator is in contact with it.

As the vibrator spends part of its time in contact with the ductor and part in contact with the table, the ink is by it taken off the former and put on the latter. The period during which the vibrator is in contact with the ductor can usually be lengthened or shortened by altering a cam. Then the ink gets distributed by the wavers all over the table; for they, being small in diameter and set at different angles, present different surfaces to the table at each part of their revolution.

Obviously, then, attention to the duct, the vibrator, and the wavers is one of the main duties of a machine minder.

The inkers, too, demand great attention; not only must they be perfect as rollers, but they must travel at such a level and with such smoothness that every part of the forme gets its due quantity of ink, no more and no less.

Nothing but practical experience will enable a workman to

manage his inking arrangements perfectly. Instructions in some matters connected with them will be given in succeeding chapters, while the management of the rollers themselves is a subject of such importance that it will have a chapter devoted to it exclusively.

CHAPTER LXIII.

PRINTING WITH TREADLE PLATEN MACHINES.

THE machine printing which is most like printing by the hand press is, of course, that which is done on platen machines, and as the only platen machines found in modern offices are the jobbing treadle platens we will commence with them.

Printing with Treadle Platen Machines.—The forme is always locked up in a chase specially adapted to the machine ; it is, indeed, supplied by the makers of the machine, and fits the type-bed exactly. It is fastened in by a spring clamp or some other simple device.

The bed is fastened to the frame generally by four screws, one at each corner, and in the centre is sometimes a set screw. By manipulating these screws the impression may be regulated, but when once the bed and the platen have been made to meet in the same plane these screws should be altered as little as possible. When an alteration has to be made it should always be done by an experienced person. It is obvious that the set screw must be loosened before either of the four corner screws is interfered with. In most modern machines the impression can be set by altering a screw or a lever in the front of the machine.

The ink-duct is generally like that described on p. 565 ;¹ the ink-table is sometimes oblong, as in the "Improved

¹ There are a few exceptions, the "Arab" machine and the "Golding Jobber" being the chief.

Gordon" and "Bremner;" sometimes cylindrical, as in the "Universal" and "Mitre"; and sometimes circular, as in the "Minerva," "Arab," and "Golding Jobber." When the circular plate is used it moves round on its axis a short distance each time the rollers pass over it, and the "Minerva" and its copies have the inking disc in two parts, the centre plate revolving one way and the outer rim revolving the other. The object of these movements of the plates is to secure distribution, for in these circular-plate machines there are but three rollers, and they, moving on the same frame, have to perform the triple part of vibrator, distributors, and inkers. In the "Bremner" and "Improved Gordon" there are more rollers, some of them being wavers (distributors) only and some inkers. The ink-table in these platen machines is stationary, but the rollers are made to pass up and down it by sliding frames holding the roller forks.

In treadle platen machines there is no tympan such as there is in the hand press. The "making ready" is done on the platen, which has to be clothed or "packed" for the purpose. There are movable fingers or grippers, which hold the paper down to the platen when it moves to the impression. When advisable, as in open formes, a frisket can be made and attached to these forks to prevent blacking.

Packing the Platen.—This is almost always done with paper, or paper and cardboard. A good packing is one sheet of glazed cardboard, two or three sheets of good smooth printing paper, and a top sheet of stout writing paper. There are two movable rims or clamps on the platen working on a hinge; lift them, lay the sheets on the platen, press the lower rim down again over the edges of the top sheet (which must overlap the platen for this purpose) till it holds the sheets firmly, then pull the sheets firmly and smoothly over the top edge of the platen and press down the upper rim. If all is smooth and taut, beat down the rims with a mallet, and all the sheets will be firmly held, and the packing complete.

If the forme be a light one, a few sheets of thin paper will be sufficient; but when the forme consists of worn type or an inferior stereo plate, several soft sheets or a thin blanket are best.

Setting the Guides.—Now take an impression without ink on the top sheet of the packing. Note where it falls. Compare it with the paper you have to work the job on, and calculate where the bottom and left-hand edges of the paper must come on the platen in order that the proper margins may be obtained. For instance, if there is to be an inch margin all round, the paper must be laid to a point one inch below, and one inch on either side of the impression made on the packing. Having ascertained these places, and marked them with a pencil, you must affix “lay-guides” or “gauges” for the sheets to rest against when they are being printed. Many printers use ordinary pins, which are stuck into the packing and have their heads bent up slightly just like the pins in the tympan of a press. Others use the special gauge pins which have been invented for the purpose, and of which illustrations are given below. They are stuck



into the packing as shown, the two little teeth observed under the head biting the upper sheet. But these are not universal favourites. For accuracy, and especially where a second printing in register is required, quadrats make the best gauges. These are glued on to the packing (generally with a bit of melted roller composition) in the exact places required. Whichever kind of gauges you use, place two for bottom lay and one for side lay, being very careful to have them in their proper places. The side gauge is best placed slightly nearer the top of the sheet to be fed than the bottom of it, this position giving greater accuracy of lay.

In setting gauges it is best, after you have ascertained where the top of the paper is to come, to mark it on the platen and then take a straight-edge or T-square and, taking the impression of some line in the forme as a guide, square by it and mark with a pencil the lines on which the side gauges should be placed.

Inking up.—Now, having seen that the duct is quite clean, put a little ink in it, put in the rollers, and “run the colour up,” *i.e.*, get a sufficient supply of ink well distributed on the ink table and on the inking rollers. This is done by running the machine for a few minutes. In all machines there is a means by which the platen may be made to stop its advance to the forme so as not to take an impression; this is called a “throw-off motion,” and, of course, the impression must be thrown off when you are running up the colour.¹

Making ready.—Having run up the colour, take an impression on its own paper, and note if it be even. If the machine be a good one and in proper order the impression will generally be satisfactory, but if it be not it must be corrected where it is weak. It not infrequently happens that the impression is a little low in the middle, and if so a piece or two of tissue paper may have to be added to the packing there to get an even impression. On the other hand, where the impression is too heavy one or two sheets must be cut away. It is best to place the sheets so patched or cut next to the iron platen, or next to the cardboard if this be used, and not on or just under the top sheet of the tympan; the upper rim being raised and the packing lifted to allow this to be done. But apart from a level impression the forme, or parts of it, may require underlaying or overlaying—or both—and these operations are performed as in hand press work. The overlays, if any, should be pasted on

¹ In the “Improved Gordon” there is besides a means of inking up without working the platen, and an ingenious device by which if it be desired the forme can be rolled, *i.e.*, inked, twice for each impression.

a sheet and inserted in the packing, generally under the two top sheets, which, of course, are put in last. When this overlay sheet is put in you may have to remove one of the sheets already on the platen in order to keep the impression right.

High-class printing is often done on these machines, and much time and thought are then bestowed on the making ready of the formes and the underlaying and overlaying of any cuts or process blocks they contain. If anything, making ready on a treadle platen machine is easier than on a hand press, for the principles are the same in each case, and in the machine there is no movable tympan, which is so often a source of trouble.

But "rush work" has sometimes to be executed on them too, and Mr. Noble described in the *Printers' Register* how he used to print on a platen a thousand newspaper contents bills in the shortest possible time. "The forme was demy folio in size and it had to be printed in brown ink; it was set partly in metal and partly in wood type, both very much worn. The machine had to be washed up for colour, the ductor reset so as to let out a much larger volume of ink, and all the low and worn letters in the forme had to be underlaid. Instead of working this job with a few sheets only, a thin blanket was used. This brought up those low letters which time did not admit of separate underlaying. While the apprentice was washing up the machine and rollers and fixing the blanket upon the platen, the overseer would pull an impression upon one of the hand presses; turn the forme face downwards upon a blanket, and with pieces of wrapper of various thicknesses underlay those letters which appeared not to print. When a second pull, taken at the hand press, still showed any defects, they were corrected as in the case of the first sheet, and the forme was placed on the machine. In a few minutes the lay was got, the inking made level, and the job rattled off with the greatest speed."

Feeding.—Having produced a good impression and run the ink up perfectly, the printing may be proceeded with. Be very careful to lay each sheet exactly to the guides. You should let the sheet or card touch the bottom gauges first and then slide it to the side gauge. Should you miss feeding a sheet, use the “throw off” immediately, or you will print on your packing and a new top sheet will most likely be necessary.

It is usual to feed with the right hand and take off with the left. These operations have to be performed very quickly and neatly, for the platen stops for the purpose not more than two seconds. You must be very careful to execute them at the right time, and on no account have your hand on the platen as it approaches the forme, or you may seriously injure it. It is necessary to keep quite cool and to work slowly until you “get into the swing” of the work, when it will be quite easy. At first, however, you will find it awkward to take off, lay on, and treadle, all, as it were, at the same time. When feeding a card or a small sheet it is usual to place the thumb under it and the fingers above, the positions being reversed when large sheets have to be fed.

Hints and Cautions.—What was said on page 667 as to dirt or damp on the forme, or on the bed, applies here also.

The forme should be always in the centre of the chase.

Should the forme be light—*i.e.*, one consisting of a small amount of matter—it is well to have type-high bearers on the inside of the chase. These will adjust the impression, and prevent the rollers from bumping against the first line and sliding off the last, which is a great detriment to good work. It is, of course, presumed that the size of the job is such that the bearers will not touch the sheets worked on.

Sometimes, in feeding, the sheets slip over the guides at the bottom of the platen. To prevent this, some printers paste over the corks or quadrats, which form those guides,

a small strip of card, wider than the quads and overhanging them on the side fed to ; this makes a kind of groove into which the sheets drop.

The type-bed of the machine should be set so that five or six sheets on the platen are the most packing that will be wanted to get a good impression.

When a forme has to be backed, to secure good register it is best to shift the side guides used for the first forme to the other side and lay to them. By these means you present the same edge of the paper to the guides. This shifting is, however, not necessary where the paper is trimmed round first and of one size.

Be very careful to turn the flywheel the right way—usually away from you, though some machines run the opposite way.

When a forme is on, before turning the machine be sure that the frisket fingers are set sufficiently apart to clear the forme or they will batter it.

On starting, try the impression by turning the wheel very gently *with the hand*, and at once stop and reverse it if there is any resistance. Never start with the foot when a fresh forme is put on.

Various Work on Treadle Platen Machines.—We will now proceed to give a few hints on the printing of work of the kinds most usual on these machines.

Printing on Writing Paper.—Use rather hard rollers and a good, stiff, short ink. If the paper is glazed use hard packing ; if rough, use a softer packing and give more impression.

Cuts and Process Blocks.—Use hard packing and be very careful with the underlaying and overlaying. Remember that very thin hard paper should be used for the overlays of process blocks. None but high-class inks and well-seasoned rollers should be employed, and whenever “art” or enamelled paper is available it should be used. On the printing of half-tone blocks, see a few chapters further on.

Envelopes.—The gum on envelopes is often uneven and sometimes in lumps, therefore the packing should be soft, or the type may get battered. Use one or two thicknesses of blotting paper in making ready.

Rule work.—To prevent cutting of the rollers it is well, where practicable, to put a piece of broad wood rule on either side of the forme, to bear off the rollers. Put on the tympan strips of paper to receive the impression of the wood rules, and change them as often as necessary.

Red Rule Borders.—The difficulty in this kind of work is that you have a line of brass rule all round a blank centre more or less large so that there is no impression except near the margins of the sheet. The great thing is to keep the sheet as close as possible to the tympan in every part so that it does not get shifted, or squeezed up in the middle, when receiving the impression. Let your packing consist of card or glazeboard and two sheets of printing over it, with a taut sheet of writing paper over all, and let the impression be just sufficient and no more. For this kind of work your machine, your forme, your guides, and your laying on must all be in good order.

Some Difficulties in Treadle Platen Work.—*Slurring.* Slurring on treadle platen machines may be caused in various ways:—

1. The forme may move on the bed. It should be fixed tight.

2. The forme may spring. Take it off the machine, put it on the stone, and test it with the fingers: if it does spring, try the effect of a strip of cardboard a pica wide between the top of the furniture and the chase all round. Springiness is generally due to one or more of these causes: bad justification, blocks in the forme not being square, warped furniture, furniture or leads binding; or a careless lock up. It is the compositor's duty to rectify any of these faults.

3. The tympan or make-ready may be out of order. It

may be tight in one place and loose in another, or baggy all over. Tighten all up evenly. You may have too many sheets on: if so remove some, and if necessary substitute a flat card.

4. The impression screws of the machine may not all be tight: if one is loose a slur is likely to occur.

5. The grippers may shift the sheet as they strike it. They must come down perfectly flat and must not slide after they have once touched the platen, and they must grip the paper closely till after the platen returns from the impression. Sometimes it is better to work with one gripper alone: try first one and then the other.

6. It may be desirable to make a sort of frisket and fasten it to the grippers.

7. The cog wheels of the machine may be worn and allow "play." The remedy is to get a new machine or at least new wheels.

Creasing.—If the paper creases, see that the packing of the platen lies close and even and that the upper sheet or tympan is smooth and taut; have as little overlay as possible, and a light impression; put the gripper as near to where the crease comes as the nature of the forme will allow.

CHAPTER LXIV.

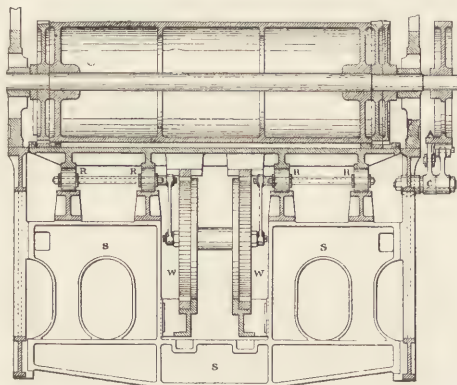
PRINTING ON CYLINDER MACHINES.—Learning the Construction of the Machines—How to set up a Wharfedale Stop-Cylinder Machine.

WE have now to deal with printing on cylinder machines, which at the present day is by far the most important branch of the art of the pressman. The different kinds of cylinder machines have been enumerated and classified in Chapter LII., but though there are so many, in most printing offices the only kind used are the one-side, single-cylinder machines, which are generally referred to when a cylinder machine, or, indeed, "a machine," is mentioned among printers.

As in the case of the hand press, it is highly desirable that the pressman, or "machine manager," as the workman who looks after a printing machine calls himself, should have a thorough knowledge of the construction and working of the machine he has to tend; for otherwise he may in the course of his work be nonplussed by little difficulties or brought to a standstill by little accidents he might avoid or overcome. The beginner should study good engravings of machines, such as are to be found in this work and in the advertisements in the trade papers, or, better still, study the machines themselves and every part of them, especially when they are in motion, taking note of every shaft, wheel, rod, and handle, and observing the part it plays in the mechanism, how it is actuated, and what its use is. The cylinder machines that are now likely to be met with in well-equipped printing offices are the stop-cylinder machines of the ordinary Wharfedale type, which includes machines

machines with explanations, the diagrams being reproductions of drawings prepared by Mr. Wm. Powrie, M.I.M.E., the London manager of Messrs. Furnival & Co., to illustrate a paper he read in February, 1899, before the Institution of Mechanical Engineers, produced by photography from the lithographed plates which form part of the Proceedings of the Institution, and which Mr. Powrie and the Council have kindly placed at our disposal.

The Stop-cylinder Wharfedale.—A general outline of the construction of this machine was given on p. 596, but the diagrams (Figs. 6 to 11) will give an intelligent reader



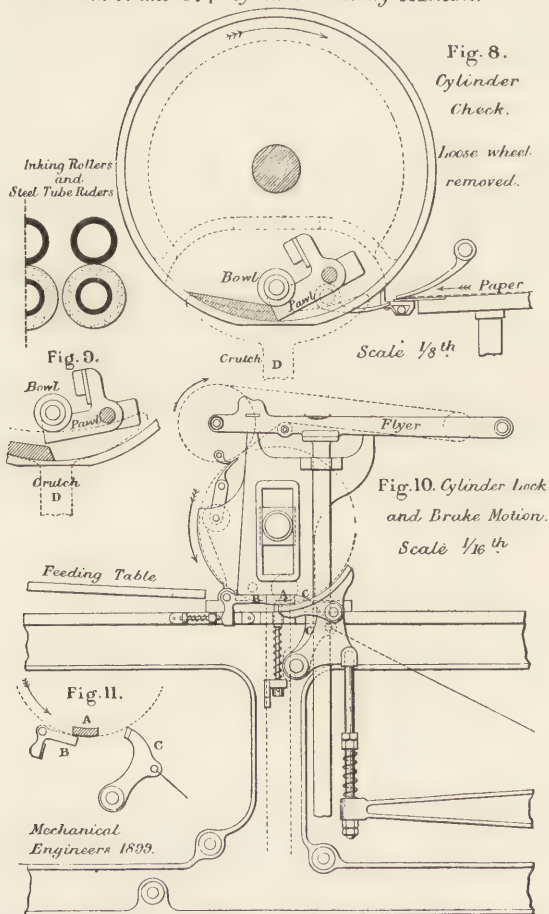
CROSS-SECTION OF WHARFEDALE (FIG. 7).

a far better conception of the mechanism. Fig. 6 shows a longitudinal section of the machine and Fig. 7 a cross section.¹ In Fig. 6 the side frame is barely outlined. At the centre of the dotted circles at the extreme left of the drawing is the main driving shaft, which carries the flywheel and is made to revolve by the band running over the driving

¹All the diagrams represent the machines made by Messrs. Furnival, but the differences between them and similar machines by other makers are mainly in matters of detail and need not be referred to here.

wheel or pulley. The large spur wheels shown next towards the right are two cog wheels driven by pinions on the main

Wharfedale Stop-Cylinder Printing Machine.



PARTS OF A STOP-CYLINDER MACHINE.

shaft. As these revolve they, by means of the connecting rods, carry to and fro on the racks the two traverse wheels

shown further to the right. Other rods connect the traverse wheels with the carriage, which is caused by them to run to and from one end of the machine to the other, air buffers being fixed at each end to receive it and assist in the change of the motion by cushioning the momentum. This carriage runs on the carriage rails or ways by means of the bowls or rollers R. In most machines there are two rails and sets of bowls, but in large ones four are often found. These are clearly shown in the cross section Fig. 7, where the four sets of bowls are marked R also, the traverse wheels being those marked W. S is the frame cross-stay immediately under the cylinder, placed there to prevent "giving" when the impression is on.

The rest of Fig. 6 almost explains itself. It will be observed that the diagram shows many rollers and drums for distributing the ink; some of these operate with a to and fro lateral movement before the ink is imparted to the ink slab or table. These extra distributing arrangements are found in high-class machines only.

The printing cylinder is driven by the carriage, which has a toothed rack at each side driving spur wheels on the cylinder ends. One of these wheels is securely fastened to the cylinder, while the other runs loose when the cylinder is at rest, the fastened wheel having a portion of its teeth planed off at the underside to clear the carriage rack on the return stroke. The loose wheel is coupled to the cylinder by a pawl clutch (see Figs. 8 and 9), so arranged that it allows the wheel to run either loose or securely attached to the cylinder as required; and an automatic cylinder check and double-rolling motion D are fitted which, when required, prevent the pawl from dropping into position to take the cylinder round each alternate revolution, so that the forme gets twice the usual amount of inking. Moreover, by touching a small lever the attendant can at will prevent the cylinder from revolving.

Figs. 8, 9, and 10 show the grippers and the arrangements for stopping the cylinder and pressing it home. In Wharfedales the sheets are fed to stops or "lays" which are on the feed-board and quite unconnected with the cylinder, so, to use Mr. Powrie's words, "any variation of the position of the cylinder when the grippers close on the sheet spoils the register. To prevent such an occurrence, these machines are fitted with a pushing motion, which presses the cylinder back to a dead stop before the grippers close on the sheet. On the inner side of the cylinder brake wheel rim is cast or fastened a projecting lug A, which is fitted to fill the space between two movable levers B and C, so arranged that when the cylinder revolves in the direction of the arrow, the projection A on the brake wheel depresses the front lever B (Fig. 11), and passes clear over it, allowing the lever to rise up to its previous position. When the cylinder stops, the other lever C (Fig. 11), which has been drawn back to allow the wheel to pass, is pressed forward by a cam and lever arrangement, and pushes the brake wheel and cylinder back until the projection A on the wheel is hard up against the front lever B (Fig. 10)."

As each sheet is fed up to the lay at the gripper edge of the feed-board, the board rises, being actuated by a cam and lever, until the sheet is in contact with the gripper edge of the cylinder; the grippers then close on it, the cylinder revolves dragging the sheet with it, and the impression is given.

After the cylinder has impressed the sheet, the grippers which held it release it, and others on the flyer cylinder immediately take hold of it; the sheet is thereupon wound round that cylinder, and passed on by tapes to the end of the sheet flyer, whence it is removed by the to and fro motion of the flyer-fan or fingers and deposited on to the delivery table. The duplication of the flyer by dotted lines in the diagram (Fig. 6) indicates that the flyer may be

raised to that level by appropriate mechanism to give unimpeded access to the cylinder.

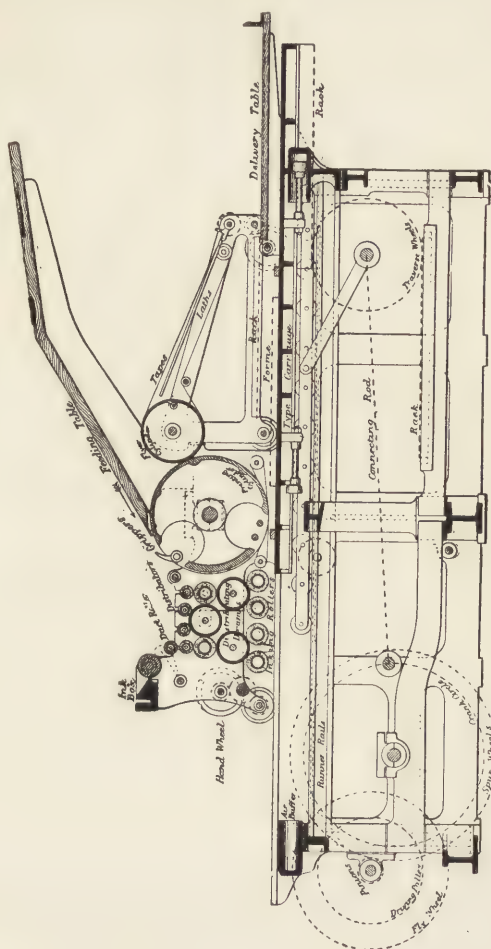
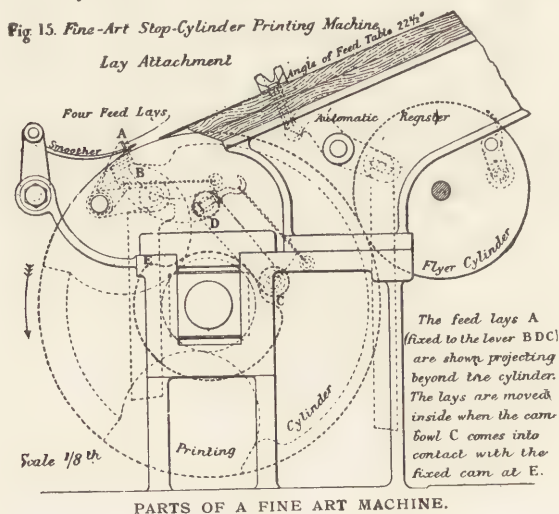


DIAGRAM OF A FINE ART WHARFEDALE (FIG. 14).

The Fine Art Wharfedales.—The large use now made of blocks produced by photo-engraving has necessitated a

higher class of machine in which much extra inking power is provided. These fine art machines dispense with the ink table and substitute for it three inking drums (see Fig. 14), which are constantly in motion and are always getting and distributing a fresh supply of ink from the ink box or duct, whereas in the ordinary Wharfedales the supply is given intermittently half the time the machine is running. It will be observed that in the fine art machines the feed-board is at the top of the cylinder and the flyer behind it. Fig. 15 shows the cylinder arrangements on a larger scale.



In some machines of this type—those illustrated on p. 610—the feed-board is made much more horizontal, the flyer being lowered to admit of this; and instead of the bowls on which the carriage runs being of small diameter they are substantial wheels nearly a foot in diameter running on rails resting on a concrete foundation; this, which is a German method, is considered to give extra solidity to the machine. In some machines the inking arrangements can

be made to slide away from the cylinder when the forme has to be made ready.

Two-revolution Machines. — In these machines the cylinder makes two revolutions to each impression, it being continually in revolution. By this construction the machine can be driven at a much higher speed than stop-cylinder machines: indeed, so fast are they that it is often difficult to find layers on quick enough to feed in the sheets, if these are of large dimensions. Machines of this type were made in England so far back as 1872, but they were then not sought for; they have now, with many improvements, been reintroduced from America under the names of "Miehle," "Century," "Optimus," etc.

In these machines the motion of the cylinder is not actuated by that of the forme carriage, each being worked by separate gearing. There are various kinds of mechanism for working the carriage to and fro, some of them very ingenious. Mr. Powrie thus describes the kind more commonly found and illustrated here: "Instead of the rack-wheel travelling forward and backward while in gear simultaneously with both the top and bottom racks, as in the machines previously described, it revolves continuously in one direction, and being mounted on a sort of cradle-frame A has a small vertical movement, which allows it to engage alternately with the top and bottom rack. Attached to the under side of the type carriage is a rectangular frame B, carrying the driving racks; and near their ends are two vertical flaps or shutters C turning on vertical pivots, which are opened and shut transversely at the proper times by the bowls or rollers D D and cam plate E. As the end of the frame B nears the rack-wheel, the shutter C opens, and allows the bowl F, carried by the rack-wheel, to pass it and get into the slot formed by the end of the frame and the edge of the shutter, which has now closed. Then the rack-wheel moves away from the rack it is driving, and the bowl

F takes charge until it comes round to the bottom of the

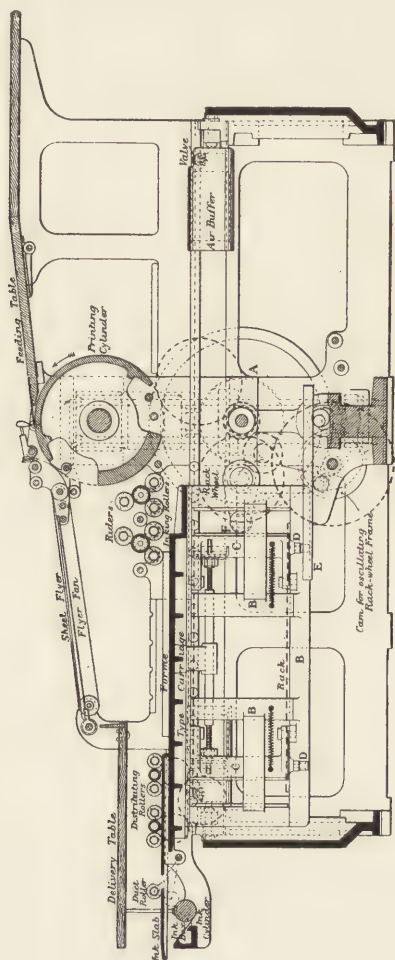
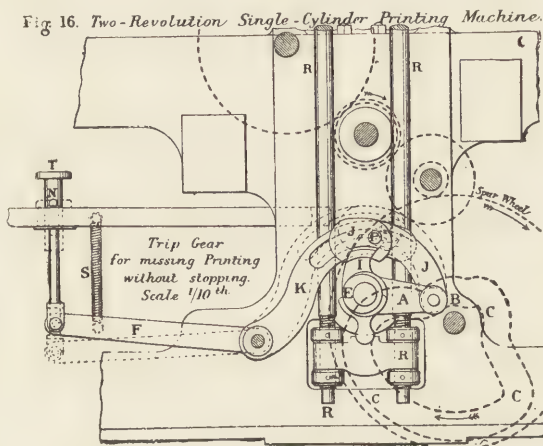


DIAGRAM OF A TWO-REVOLUTION MACHINE.

slot, when the rack-wheel engages with the other rack, the shutter opens, and the carriage proceeds on the return

journey. These movements are repeated at each end of the stroke.

"As this method of driving gives an even, steady speed of travel, with only a short stay at the ends, the momentum of the carriage is considerable, and is taken up at each end of the frame by the air-buffers, which soften the shock at the ends of the stroke, and give the carriage an impulse for its return. As already stated, the cylinder is not driven by the carriage, but, in order to ensure accurate register, a few



PARTS OF A TWO-REVOLUTION MACHINE.

teeth on the cylinder and type carriage engage with each other when the printing surface is about to meet the forme. The sheets are fed in to the top of the cylinder as in fine-art machines; but the lays are attached to the frame, and are removed out of the way when the grippers seize the sheet, which is carried round by the cylinder, printed, and delivered by a flyer in the usual way. . . . During the printing the cylinder is pressed down and held in contact with the forme by a pair of toggles or eccentrics E, Fig. 16; and when the forme has passed under it the eccentrics are released, and

the cylinder is raised about a quarter of an inch by helical springs at the top of the impression rods R R, in order to clear the forme during its return stroke. The bowl B, carried at the end of an arm A, which turns loose upon the eccentric shaft E, runs in the groove of the impression cam C, which revolves in the direction of the arrow. On the spindle of the bowl is centred a quadrantal jaw-lever J, having on its underside a jaw engaging the impression arm I which is fixed upon the eccentric shaft E. In the jaw-lever is fixed a pin P, which works in a quadrantal slot in the check-lever K, keeping the jaw engaging with the arm J while both move together through nearly a quadrant of a circle and back during each revolution of the cam C, thereby rotating the eccentrics E through the same angle forwards and backwards for applying the pressure upon the forme and relieving it again. When it is desired to miss printing without stopping the machine, the cylinder is retained in its highest position by engaging the jaw-lever J by means of the foot-lever F, which is depressed by the treadle T at the feeder's stand. The check-lever K and the jaw-lever J are thereby raised into the positions shown by the dotted lines: so that, while the impression cam C continues to revolve, the jaw-lever J works clear of the impression arm I, and the eccentrics E are not brought into action for depressing the cylinder. The treadle T is held down as long as required by the pin N catching underneath the foot-board: when this is released by pushing it aside with the foot, the treadle and foot-lever F are raised to their original position by the helical spring S. The jaw-lever J then drops into gear again with the impression arm I."

Large-cylinder Perfecting Machines.—The diagram illustrates the kind of perfecting machines most commonly found in printing offices. These machines are thus described by Mr. Powrie: "The type carriage is driven by a horizontal pinion, secured to the top of a vertical spindle, and acting

on a rack with two flat sides and round ends, which is

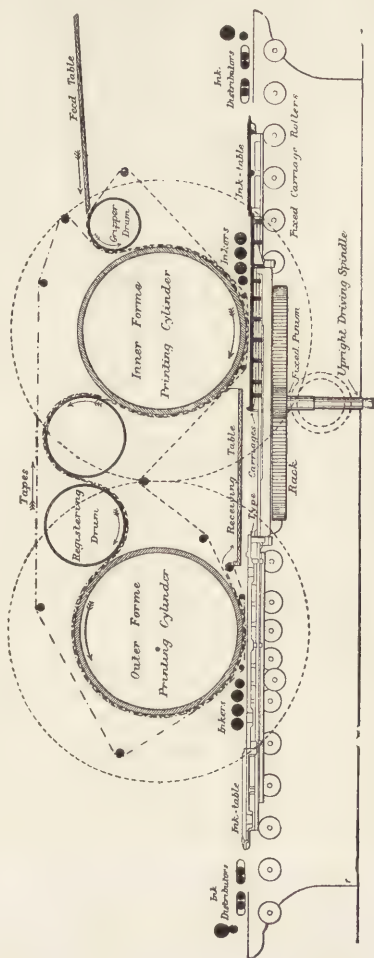


DIAGRAM OF PERFECTING MACHINE.

secured to the type carriage, but is free to move transversely; so that the pinion may gear into each side of the

rack alternately, and cause the carriage to move first to one end and then to the other. Each type-forme comes under its own cylinder, and the sheet of paper is printed first on one side and then on the other.

“The cylinders run in fixed bearings, adjustable vertically to suit the impression, and the registering drum is also adjustable vertically, so as to vary the length of the tapes between the inner and outer forme-cylinders, and also to alter the position of the sheet on the latter while being printed in order to ensure the pages being exactly opposite each other on both sides of the paper. The printing surfaces of the cylinders are covered, as in the single-cylinder machines, with calico for the ‘overlays’ and a few sheets of paper or a blanket, according to the class of work and the result required; the remaining portion of their circumference is made about $\frac{1}{4}$ inch less in radius, so as to clear the formes during their return. The sheets to be printed are laid in a pile on the feed-table, which is a fixture, and are fanned out at the front; so that the feeder has but a small distance to move them, and usually ‘strokes’ them down to the front lay marks with a hard wood or bone stroker. The gripper drum, which is about one-third the diameter of the printing cylinders, opens its grippers each alternate revolution. These seize the sheet by the front edge, and draw it forward into the tapes; then the grippers open, and the sheet held between the two sets of tapes is carried round the cylinders until it is printed on both sides, and deposited on the receiving table. The inking arrangements are similar to those on the two-colour stop-cylinder machine, as there is an ink box or duct, with ink table, distributing and inking rollers, at each end of the machine, one set for each forme.

“In these machines as usually constructed, only two inking rollers clear a full-size forme, which is not sufficient for good illustrated work; but the inking may be improved by applying

a continuous inking arrangement similar to that shown on the fine-art machine (p. 723). Flyers are now also frequently attached for delivering the printed sheets, and air-buffers for softening the shock of the type carriage at the end of each stroke."

How to set up an Ordinary Wharfedale Machine.—As printers at a distance from printers' engineers often have to set up their own machines, we will give instructions in the way of doing it. Only let us premise that it is always best to have them erected by thoroughly competent persons. Perfecting, two-feeder, and two-colour machines, indeed, should always be erected by a skilled engineer. The instructions apply especially to the erection of machines of the ordinary Wharfedale type, but they serve also for most other single-side cylinder machines.

The first thing to be done on the arrival of the machine is to carefully wipe off the grit and grease from all the parts, taking note of the marks which may be on each part as it is cleaned. Wharfedale machines generally are marked with the letters R and L, indicating the right and left hand side of the machine as one stands at the feed end. The first pieces to be put together are, of course, the two side frames with their end frames or stretchers. These should be fitted in the two castings with the racks attached to them. These are placed between the middle and front stretcher, but in some sizes of the Wharfedale they continue throughout the machine and become bearings for the spur-wheel shafts. Now take the two shroud wheels (the geared wheels with the flange on the side), and be careful to put the marked teeth in the wheels into the marked teeth in the racks. Look out the five cams which work on the short shafts (three inside the machine and one on either end of the short shaft). These must be loosely put on as the short shafts are fitted into their bearings, which should now be done; the positions of these cams are indicated by diamond-shaped points or marks on the shafts. The cams are fixed by screwing the set-screws into the countersinks.

Take the two spur wheels and place the one marked R on its shaft. Now fit into this wheel the crank pin and eccentric, on this place the long cast rod, and connect the other end of the rod to the shroud wheels by means of a stud pin. Now place the other spur wheel in position on the crank pin and project shaft L into the wheel; put nuts and washers on, and screw all up tight. Look out two shafts the width of the machine, and also several levers and balance weights;

pass the shafts through the machine into their bearings at the foot of the side frames, sliding on the levers and weights as indicated by the marking. Connect these levers to the cams by means of the friction rollers and wrought-iron polished rods.

Next put into the slots on the inside of the side frames the flat rods and half-moon shaped piece. The latter goes on the left-hand side of the machine, and the former on the right-hand side; connect these with their respective levers.

The two ribs should now be fitted into their places on the top of the stretchers, and the runners carefully placed in each according to the markings and connected to the shroud wheels by the rod and links.

The fly wheel shaft, with its pinions and collars, should now be put into its place and the fly wheel attached. The machine, so far as it is erected, may now be turned to see that all works freely.

Next lift into its place the table or coffin. It is essential that the teeth of the racks on the table should fit exactly into the corresponding marks on the shroud wheels. Now get a spirit level, and see that the machine stands perfectly true, raising the low corners by placing wooden wedges under the bottom of the frame. The cylinder may now be lifted on to the machine, and after the shafts have been carefully wiped and cleaned the geared wheels may be placed at either side, one being screwed up tight and the other remaining loose on the shaft. Plummer blocks should now be placed on the ends of these shafts, and great care should be taken that the marked tooth of the loose wheel fits into the correspondingly marked teeth of the rack on the table. The wheel and rack on the other side will necessarily work correctly. The brake wheel should be fixed on the right side of the cylinder shaft with the register lock motion; the small bell crank piece fits on a stud at the side of the plummer block. On the other end of the shaft is attached a small turned wheel for the stop motion, and the small bent handle is bolted to the side frame.

The ink duct may now be fitted on, as well as the ink table. Next place the board brackets in their positions, and the two side rods for lifting the board. Now the roller brackets may be bolted to the frame in their respective positions. The flyers are attached to the machine on top of the plummer blocks, and, being nearly always sent fitted together, only require attaching in their positions. The quadrant which works the ratchet for operating the gate is attached to a stud pin on the side of the frame, and the small handle is fitted on a stud close to it for the purpose of moving the quadrant when the flyers require to be lifted. The boards should now be screwed on in their respective positions, and after the steam pulleys and other minor

parts have been fixed in the positions which will be apparent to any person erecting the machine, go carefully over all the nuts and screws and see that they are properly tightened, and take care that all keys are sufficiently driven up. The machine should be oiled in every bearing as it is put together, care being taken that no dirt or grit is left in the bearings.

The machine should be slowly turned by hand several times before the power is applied to it.

The foregoing instructions are given on the assumption that the reader knows something of a printing machine, and that he will have before him a woodcut or illustration of the machine which he is about to erect.

CHAPTER LXV.

MACHINE PRINTING.—General Operations—Packing the Cylinder—
Centring the Forme—Getting the Pitch—Fastening—Testing
Impression—Making Ready—Inking-up—Feeding—Taking off—
Clearing away.

General Operations.—Work of all kinds is done on single-side cylinder machines, from the slovenly bill to the most finished cut or half-tone work, from the job printed on the poorest paper with the commonest black ink to the picture on an expensive sheet in ten or a dozen colours; but whatever may be the class of work, there are some operations which have always to be performed, and it is these we shall describe in this chapter.

Packing the Cylinder.—As in all other machines and presses, to prevent too harsh a contact with the forme and to obtain the best results, that which gives the impression has to be packed, and in this case it is the cylinder. Here, as before, there are the two systems of packing—the old style of soft packing with a blanket, and the modern style of hard packing with sheets of paper, with or without cardboard. In these days by far the greater part of the work printed is executed with type in good condition on dry, smooth-faced paper, and therefore hard packing is usual. We shall give two or three modes of performing the operation of packing or dressing the cylinder, according to both systems, commencing with that which we conceive to be the most usual method for the production of good work of all ordinary kinds with book and jobbing types, with or

without blocks, and following with modes which are better adapted for the printing of worn types and stereo plates and common work generally.

Hard Packing.—*Mode 1.*—The packing commences with a piece of cambric or fine calico put round the cylinder. The end of it is placed on the flat bar inside the cylinder, and the other bar is screwed down on to it. The cambric must now be carried evenly and tightly round the cylinder, the other end of it wound over the bar, and the whole tightened with the ratchet wheel. On this cambric has to be placed the rest of the packing, consisting of sheets of paper, from four to ten in number, according to their thickness, and the number of sheets the cylinder will carry, which is mainly determined by the height of the cylinder above the type bed.

Take five or six sheets of good, tough, smooth printing paper, say about 40 lb. double demy. Paste them neatly at one end only, leaving a ridge of paste about half or three-quarters of an inch. Then take one of them, lay the pasted portion inside the gripper edge of the cylinder, and rub it with the finger until it thoroughly adheres. Stretch the rest of the sheet round the cylinder. Its size should be such that the far end of it should all but meet the opposite side. There must be neither creasing nor bulging in this sheet; it must be smooth, and close to the cylinder in every part.

Put on the rest of the sheets, one by one, in the same manner, taking precautions against their bagging or bulging. Be sure, too, that they are properly secured and cannot come loose in the subsequent working.

Then take a slightly thinner and larger sheet which has been evenly damped all over by being treated, with several others, like paper wetted down for printing upon (see p. 645). Paste this at both edges, bring it firmly and smoothly over all the other sheets, and fasten it on the cambric at the

far end. This as it dries will make a tight covering for the rest ; on it the making-ready sheets will be placed.

Remember that when all the making ready is on, the circumference of the packed cylinder and the travel of the bed must be equivalent or in exact harmony ; hence care must be taken not to pack too much. (This applies to any sort of packing, and particularly to hard packing.) If the packing is too thick, the circumference of the cylinder is made larger than it should be, and out of harmony with the forme surface, the result being a drag or slur. The wood bearers of the cylinder must always press up to the bands of the cylinder, and the bearers must always be of sufficient width and strength to carry the cylinder round after it is started by rack and wheel.

Mode 2.—This consists in covering the cylinder with a piece of thick, smooth card or glazed board over which are placed four or five sheets of good printing paper. Take the card or glazed board, apply a straight-edge about two inches from the long edge, and score it with a knife, so that it will bend easily ; then fasten it to the cylinder as if it were the calico. See that it bends quite close and solid where the impression commences, or a slur will be inevitable. Next add as many sheets of good white paper as will be necessary to bring up the circumference to the proper measure when the making ready is on, and cover the whole with a sheet of strong, even paper, fastened at both ends.

Mode 3.—Semi-hard Packing.—The following has been recommended as a good all-round packing for the cylinder machine of a country office, where the work is of a miscellaneous kind, and economy of time is a prime consideration. Use the ordinary glazed calico, as fine and even in surface as it can be got, and put it on the cylinder in the ordinary way. Now loosen the ratchet which secures it, throw the calico back, and place on the cylinder close up to the gripper edge, perfectly flat and smooth, six to ten sheets

of thin double crown or double demy. Draw the calico tightly over them, and fasten it up perfectly tight, taking care that in doing so the sheets do not slip away from the edge of the cylinder. The impression given by this packing is very similar to that given by the sheets inside the tympan of a hand press, and unless there be very long numbers of one job which would thoroughly indent them, these sheets may be left under the calico for weeks at a stretch, without being changed or shifted.

When a machine is prepared in this way, the bringing-up sheets and the overlays are put on in the following manner: Before striking a sheet through, paste one sheet of moderately stout paper—say 40 lb. double demy—over the cylinder. Paste it underneath the edge of the cylinder on the taking and to the calico on the leaving edge. It may be either wet or dry, according as time presses or not. When tight, the sheet may be pulled as though it were its own paper.

Defects of impression may be remedied in two ways. Cut some strips of paper and overlay the lines precisely as if patching a sheet at the hand press; or, bring up a sheet upon the back, paste it on the cylinder in the place indicated by the impression on the sheet and cover it, for the sake of protection, with another sheet pasted over it. As soon as the job is off, the sheet or sheets, including bringing-up sheets or overlays, are torn right away from the cylinder and another sheet is pasted up in readiness for the next job.

Soft Packing.—Stretch the glazed calico over the cylinder and tighten it up by the ratchet in the usual way. Then paste a couple of sheets over the cylinder. Select a good blanket and put it on, pinning it, at the end where it leaves off, on to the calico. If the formes to be worked are well planed down, brushed out with turps, and dried thoroughly, and the rollers are good, a whole series of jobs can be worked without changing this blanket.

If from inequalities in the blanket or packing, or any other cause, the impression is defective, it may be necessary to cut a thin sheet out, and stick it on the cylinder. Take a sheet of clean paper and lay it on the grippers. Strike (*i.e.*, turn) the machine slowly and carefully half way round, stopping it before the grippers have time to open. Then take a bodkin or fine penknife and prick the sheet and blanket through in two or three places, so that a mark is left upon the sheets that are pasted upon the cylinder. Then, while the grippers still have hold of the sheet and the blanket, take a piece of chalk and mark the leaving end of the blanket and cylinder. The object is, that when the blanket is thrown back, it can be got into the same position if required. The pins may now be taken out of the blanket, and the blanket thrown right back, the marks which have been made with the bodkin being the guides for getting the sheet—which has been brought up in proper position upon the cylinder—in the right relation to the forme, the places where the sheet was pierced being made to coincide with the marks upon the cylinder. Now pin the blanket down in the same position, the chalk marks being the guide. The job may be started and run off.

The overlay must be removed when the job is finished, by throwing the blanket back and cutting away the top sheet, overlay and all. Replace this sheet by another, pasted close up to the gripper edge, ready for the next job. The bringing up of a job like this, getting the blanket back, and pasting the sheet up, should not occupy more than ten minutes.

In some offices where work of this class is done, unless the impression is very bad indeed, the trouble would not be taken of lifting the blanket at all. A piece of paper would be slipped under the forme, or a piece pasted on the outside of the blanket. When a job treated in this way is off, the blanket need not be wholly removed, but merely thrown

back, taking care that the grippers have hold of it. The sheet with the overlay upon it should then be carefully cut through at the edge of the cylinder, thrown back, and torn off at the leaving end. When the other sheet has been pasted up and the blanket pinned in its place again, the machine is ready for another job.

Putting on the Forme.—*Dropping the Forme.*—Use the same precautions as in press work, to see that the bed of the machine and the forme are both dry and free from dirt, etc.¹ Then drop the forme on the bed carefully as on the hand press. For these purposes you must run out the carriage of the machine, so that as much as possible of the bed is exposed.

Locating the Forme.—Now ascertain the position in which the forme must stand on the bed in order that the sheet may have proper margin when printed. No general rule can be given for this purpose, as all depends upon the size and construction of the machine. If you are working at a new machine, you may take a little pains to learn this, as you will not require to find it out by experiment again.

Three directions must be observed:—

(a) When possible, the heaviest part of the forme should be next to the ink table, so that it gets well inked.

(b) The forme must be as nearly as possible in the middle of the bed; that is to say, it should be at an equal distance in either direction from the cylinder bearers (the strips of wood on either side on which the cylinder runs).

(c) Especial care must be taken that in the first experimental arrangement the forme is free of the grippers when the cylinder revolves; otherwise, a batter of the forme or a fracture of the grippers will be the consequence.

Getting the Pitch.—The act of setting the forme, or rather the edge of the type, the proper distance from the edge of

¹ See pages 667 and 668.

the bed of the machine, so that the impression when pulled will have the correct margin, is called "getting the pitch."

To find out exactly where the edge of the cylinder will fall, put a little ink on the end of the cylinder level with the gripper edge, and move the machine round. The ink will then come off on the bearer. A mark should then be made, and a piece of brass rule cut as a gauge, for use when working subsequent formes. Formes should never be put closer to the cylinder than that mark.

Fastening the Forme.—The space between the chase and the ink table must be accurately and tightly filled up with furniture and leads. Then the forme must be fastened, so as to prevent it from being shifted by the action of the rollers or the movement of the carriage. The various expedients for doing a similar job on a press may be used for a machine.¹ Be sure that the fastening will not "spring" in working, or the cylinder may be endangered, and equally careful that no leads, furniture, etc., are so loose as to be lifted up by the rollers. Of course, it is only necessary to fasten the forme at one side, as it is not liable to move in any but a lateral direction. Then take away from the bed all quoins, letters, leads, etc., that are not wanted, and plane the forme with mallet and planer.

Setting the Grippers and Lay Gauges.—The grippers are arranged so as to ensure several of them taking hold of the sheet. If necessary, they must be shifted along the bar that holds them and adjusted by their screws so as to catch the sheet near its ends. It is not often necessary to shift the grippers.

Now set the lay gauges on the machine, so that the paper when fed to these will, as you calculate, occupy the right

¹ See page 670. A rack chase fitting the bed of the machine is the best thing to have where small formes have to be worked; otherwise, the small chase may be locked up in a larger one, nearly the size of the bed, and that fastened with quoins and furniture.

position on the cylinder to receive the impression where it is intended to be.

Testing the Impression.—The rollers must not be put in their places yet; it is necessary to run through a sheet or two to find out whether the impression is correct.

The feeder usually stands at the machine so that the pile of paper is on his right hand, and the action of the machine takes the sheet away to his left.

Lay the sheet to both the side and the front gauge. Then turn the fly-wheel slowly with the hands, keeping the eyes on the machine all the time, lest anything should have got loose or mislaid or be carried in. Turn the wheel round until the sheet partially makes its appearance at the other end, but not sufficient to cause the grippers to entirely release it. Note the margin at top and bottom. Turn the wheel round a little more, and the sheet will be disengaged. If the margin is not correct, alter the lay gauges accordingly.

Making Ready.—You have now to “make ready” the forme, possibly with underlays and overlays. It is done precisely as at press, as described in Chapter LXI. and on page 679. The sheet, cut and pasted, is put on the cylinder’s packing, and over it is put a top sheet, as was described in connection with treadle platen machines (page 709). This top sheet is fastened to the cylinder like the other sheets of the packing.

Formes free from blocks are seldom or never underlaid. If rule be used in the forme, cut out sufficient of the make-ready sheets to prevent it from penetrating the paper which has to be impressed.

Before making ready, it is generally advisable, when the forme is one of importance, that the machine-minder should get, by temporary overlays, a readable proof of the forme to be printed, on its own paper, and with proper margins. This proof should be sent to the overseer for approval.

Permanent overlays may be postponed until the reader or overseer has intimated that the forme is right. The minder should keep the initialled proof as his authority to go ahead, and his inability to show such proof may be regarded as evidence that he has begun working without orders.

Making ready on fine work must always begin with a light impression. On the other hand, making ready on ordinary hurried work may begin with a firm impression, with proper paper or blanket packing of the cylinder. In the latter case, where the impression is too hard, the extra packing may be cut out.

It is usually a mistake to waste time over thoroughly bad materials. If electrotypes are uneven in thickness, if they are bad casts, are crookedly bevelled, or have faults that cause unusual delay in making ready, they should be reported to the overseer, who should return them to the electrotyper. The machine-minder should not waste time in hiding the electrotyper's faults.

If a letterpress forme is in a chase that will not lie flat on the bed; if quads rise, or types are off their feet; if pages are sprung or twisted, so that they will not register, the forme should be returned to the composing-room to be made right.

Preparing to Run.—Down to this point the driving strap should either be off the machine entirely or running on the loose pulley. Having made ready, however, the strap may be put on to the loose pulley if it be not there already.¹

Inking-up.—A good impression having been secured, a proof in ink should be taken. This necessitates the arrangement of the inking apparatus; but if a proof is wanted in a hurry, the forme may be rolled with an ordinary press roller,

¹ The object of throwing the strap off altogether is that the machine cannot then be driven accidentally while it is being prepared for work; but if the driving shaft be out of reach the plan is impracticable.

inked-up on the table of the machine, if there be no press table handy, and the inking rollers of the machine put in order while the proof is being examined.

Now give the duct its proper supply of ink.¹ The duct and the mode of managing it were described on pages 565 and 566, and reference to that description should now be made by the reader unless he well remembers it. If there are movable stops in the duct, and the forme is a small one, shift them so that the table and rollers will take ink only where it will be used. Turn round the duct roller a few times by the hand wheel at the end, in order to get it completely covered with the ink given out by the knife. Then put on the vibrator and the distributors. Supply ink moderately at first, gradually increasing it till the proper amount is reached.

Cutting the Vibrator.—You may have to cut the vibrator, if the forme is small or irregular and the run a long one, otherwise too much ink will accumulate on the parts of the table opposite to which there is no type; but never cut it if you can help it, for it necessitates getting a new vibrator for the next job. If you cut it, use a fine sharp knife, and do not cut the composition entirely away from the parts which are wanted not to touch the table and duct, or the rest will be loosened.

Running off Waste Sheets.—Work the machine a few times before putting on the inkers, to get the ductor, vibrator, distributors, and ink table in nice condition. Then lay down the inking rollers in their places. See that they are sound and seasoned, have a good face, and run truly on their axes. Run through a few waste sheets till the proper colour is got up. All being right, fix on the

¹ If the job is one of a few copies only—say 50—of a small forme, you may dispense with ink in the duct. A little ink may be placed on the wavers with a palette knife, and this will ink the table and cover the inking-rollers.

taking-off board, and if the ink duct has a lid turn it down. Place the heap of paper on the board behind the rising feed-board, and you are ready to begin working off.

Feeding.—Constant care must be taken to feed the sheets well up to the gauges. If this is not done, the impression will not be straight, or will be out of the centre of the sheet. Endeavour to put the sheets in their proper place by one motion of the hand, deliberately, yet rapidly and with confidence.¹

For some time after starting to work examine each sheet singly, to see that the colour is right, and if it has to be kept to a certain standard compare it with the standard by pinning the two against a wall and looking at them from a standpoint some eight feet off if possible. If the colour is not right, regulate the rollers or the duct.

Taking-off is now almost always done by the automatic flyer. When it is done by hand² it is such a simple operation that it does not need any explanation. It is best to remove the sheet with the left hand and keep the heap straight with the right hand. When large sheets are being worked, however, both hands will be required.

Clearing away.—The job having been worked off, lift up the taking-off board, remove the forme, and either put the rollers on the forks or carry them away to the proper roller closet. Rollers should never be allowed to stand on the ink table. The ink-duct may now be cleaned out if it is deemed necessary, the top sheet or two of the packing removed, and the machine be overhauled generally and prepared for another job.

¹ The machine-minder rarely feeds the sheets in to the machine. It is done by a boy called a "layer-on," but he must nevertheless be an adept at doing it himself.

² This work is also generally done by a boy, called a "taker-off."

CHAPTER LXVI.

MACHINE PRINTING.—Registering—Packing Roller and Cylinder Bearers—Working from Plates.

Registering.—What has already been dealt with applies to all kinds of formes ; registering is wanted only where the same sheets of paper have to be passed through the machine more than once, for instance in bookwork, where both sides of the sheets have to be printed upon, or where a job has to be worked in more than one colour.

Registering at machine is done in two ways: with points and without them. Pointing is the way to get the truest register, but for ordinary work, if the layer-on is good and works accurately to his gauges, there is no need for it, and whenever it is adopted it retards the output of the machine unless the feeder be very expert indeed.

Registering with Points.—The forme being fastened in the bed of the machine, fix two points on the cross-bar of the chase, one at each side. These are to make holes to be used for registering when the sheet is turned or backed. The points usually made for the purpose consist of a single spur soldered or screwed into a piece of four-to-pica brass rule or into an iron plate of about the same thickness. Sometimes this plate is from an inch and a half to two inches long, and has a hole drilled in each end, so as to admit the passage of screws, by which means they may be screwed to the furniture, the points being arranged so that they will come in the middle of the cross, about two inches from each end of the paper. Sometimes, however,

the points are merely soldered into small pieces of brass rule not wider than the width of the cross, and have no screw-holes in them; this sort of point is fixed to the cross by means of Prout's elastic glue.

When the spurs are securely fixed, pull a sheet upon one side of the paper. Having satisfied yourself that the holes are sufficiently through the paper, turn over the sheet¹—printed side uppermost—and place it upon the feeding or laying-on board, with the same lay-edge towards the grippers as before. Then loosen the points under the feed-board upon the point-frame, and shift until they fit the holes in the sheet upon the board. This done, place the sheet upon the feed-points, strike it through the machine,² and examine it for register. If the sheet has been laid very accurately as to margin, and the forme has been well made up by the compositor, the register may be all right; but it is very improbable that this will be so. If there is the least difference in the width of the margin at either end of the lay-edge, the point (at the feeding-board) will have to be sent in or drawn back, as the case may be, so as to make the sides register. When the sides have been got as near as can be, by means of the points, the register of the heads may be examined. If they are all out of register one way, the sheet must be altered by means of the points, but only to half the apparent distance they are out. For example, if the heads are found to be a nonpareil out of register, the sheet must be shifted a thick lead, upon exactly the same principle as if it were half-sheet register at press. If, when this is done, individual pages are found not to register, they must be altered in the forme; but in doing this it is not necessary to unlock the whole of the sixteen pages, but only half of them; for in half-sheet register it

¹ We assume the forme to be worked off is a half-sheet forme.

² This means turn the machine slowly, and let it make an impression upon the paper.

is only necessary to alter one-half of the forme and not the whole.

Registering without Points.—The following is a method of doing register work in a fairly satisfactory manner without the aid of the pointing apparatus: Get a very accurate lay for the first side of the job. When worked off, turn over the leaf for the perfecting. Let the layer-on lay to the side gauge on the other side of the machine, so as to lay the second side to the same lay-edge as in working the white paper. The result will depend largely on the skill of the layer-on.

In printing a half-sheet of 12mo the boy will lay both sides of the work in on the same side of the machine; but the first side must be laid to front marks and the second to back marks, so as to lay to the same lay-edge.

Registering Sheet Work.—What we have said about registering applies to sheet work as well as to half-sheet work, but sheet work requires some additional treatment, inasmuch as in it the first side is backed by another forme and not by the same forme as in half-sheet work. When printing from two formes, then, before lifting the first forme off the bed of the machine, you should cut a gauge both for the sides and the pitch. Get a piece of stiff wrapper and take the exact distance from one of the head-lines to the side of the impression-bearer; then take the distance from the edge of the table to the side of the forme at the pitch where the impression takes, and mark these upon the wrapper by cutting a piece out of it. Now lift the forme and lay the next one on; if the gauge has been cut very carefully, this should enable you to get your second forme in the same relative position as the first one. If the chases of the series of formes to be printed are all of one size, the same furniture will do for fixing, and they will simply have to be locked up; if, on the other hand, the chases vary in size, the furniture must be altered until the forme is in the position indicated by the gauge.

Packing the Roller Bearers.—You may find that the inking rollers leave too much ink on the edges of the types next “gutters” or “backs.” This is because the rollers dip into the hollows these cause. The remedy is to pack the roller bearers where the gutters (or backs) occur by sticking (with glue or tacks) small pieces of thin leather, or brown or other paper, on the bearers. The rollers have wheels or trucks which run on the bearers, and the moment they leave the type they will be raised by the wheels having to mount and travel over the packing on the bearers; they descend again the moment the type is again reached, for the packing there ceases. Care must be taken to shave off the ends of the packing, so that the transition is not too sudden. Of course, the packing must be fixed exactly opposite to the places where the rollers should ascend.

Packing the Cylinder Bearers.—This is not to be recommended, and is never required when the machine is in good order, but it is sometimes necessary where the cylinder brasses or the bearers are worn.

Fasten a thin piece of paper on the cylinder bearers, in places corresponding with the gutters, so as to bear off the impression. The cylinder must always be kept tight on its bearers.¹ Packing the cylinder bearers may prevent slurs and the blurred appearance of some work done by persons who neglect these precautions, but it is far better to get an engineer to keep the cylinder brasses and the bearers in order.

Working from Stereo or Electro Plates.—It often happens that books and magazines are printed, not from the types themselves, but from stereos or electros taken from them, each page forming a separate plate. These stereos or electros are not generally supplied “mounted.”²

¹ These are generally made of gun metal or brass.

² A stereo or electro fixed upon a foundation which gives it the height of type is said to be “mounted.” Mounts are generally of wood, but sometimes they are of metal.

They come from the foundry about one-eighth or one-sixth inch in thickness, and require to be brought up type-high with mounting-blocks or "risers." Of these risers there are a great number of varieties. The old-fashioned style consisted of two pieces of mahogany, with brass catches at the sides to secure the plates. Their faults were that they would not always lock up level when dry, and were always liable to warp when wet. Hence they were superseded by metal risers, cast to various sizes of bookwork, such as 8vo, 12mo, 18mo, etc., brass catches being also affixed to them.

The metal riser will be found to be in several pieces, some larger than others. Get one of the plates to be worked off and make up a bed for it, according to its size, using the largest pieces first, and adding small ones as necessary. The bed must be about a long primer larger on both sides than the plate, because there must be room for the catch. Now make up the mounts for all the other plates contained in the forme in the same way. Put a catch at the top, one at the bottom, and two at each of the two sides.

The next thing to be done is to arrange the pages on the coffin of the machine—that is to say, to impose them. Instruction on the subject of imposition is to be found in Chapters XXIII. to XXVI.

After the pages are put in their proper places, you must make margin with wood or metal furniture. On this subject instruction is given in Chapter XXVIII. The forme must now be locked up and properly located on the coffin of the machine. The pitch having been duly obtained, strike a sheet through and see if the plates as they stand on their mounts are type-high and even throughout. If they are not, they must be underlaid. This must be done very carefully, as any deficiency in this respect cannot afterwards be remedied by overlaying—at least, not satisfactorily. Sometimes two and three thicknesses of paper are desirable.

It is well to test the pages again with the straight-edge after they have been underlaid, lest they should have got shifted in that process. You must ascertain also that all the plates are in a line one with another—that there is not too much space between some and too little between others. This is done by using the straight-edge and T-square, as previously stated. Begin with one row, and regulate the others accordingly. The furniture having now been finally adjusted, the forme is locked up, planed, and made ready.

In large houses formes of mounts of regular sizes are kept ready locked up, and only require to be loosened, the plates laid down in their places, and refastened up, when they are ready to be worked from.

After stereo plates have been printed from, they should be washed over with potash and rinsed with water. Electro plates and wood blocks should, in addition, be slightly oiled and packed up in paper. Unless so oiled, electrotypes will in time become covered with verdigris.

Plate Mounts.—Of the several different kinds of mounts for plate-work we may mention three—Hoe's, Caslon's, and Dalziel's.

Hoe's Mounts are the best, but they are very expensive. The mount consists of an iron bed on two sides of which are fixed catches and on the other sides are two sets of movable catches, the latter being moved to and fro over the face of the mount by horizontal screws working from two of the sides at right angles to one another. Each screw has a cog-wheel head, which is easily and rapidly turned by a toothed instrument, something like a comb, held in the hand and passed over it. In this way any sized plate can be securely clamped without fear of slipping.

Similar mounts of wood with brass sides and fittings are made by other American manufacturers. One sort has long been in use at Messrs. Cassell's.

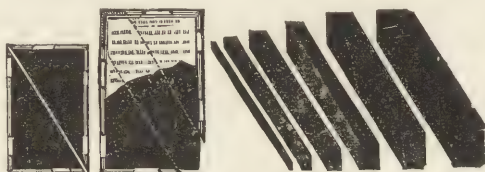
Caslon's Mount is a very simple device, as may be seen from the sectional block annexed. The shaded part is the metal mount, and the black ends are brass catches made of four-to-pica rule. The mount being bevelled a little at the



CASLON'S MOUNTS.

lower edges, the bottom projection of the catch holds there, and the upper projection clamps the plate which is laid on the mount. Locking up the forme holds all securely together. It is obvious that every sized plate requires its own special mount in this system.

Dalziel's system is devised for the purpose of lessening the number of different-sized mounts that have to be kept. It consists of angle pieces of equal size and movable central supports of varying widths. By using two of the angle pieces and selecting an appropriate centre support, pages of various



DALZIEL'S MOUNTS.

sizes may readily be mounted. The angle pieces are fitted with fixed catches to hold the plates, and when the forme is locked up these secure them tightly. These mounts are of iron. Great care must be taken in locking up the angle pieces, or the plates may be split or buckled, or the register altered.

Many printers prefer to screw their plates down to wooden mounts, so as to prevent effectually their rising or getting displaced—an occurrence not unknown when catches are relied on. Mr. R. Clay devised a mode of fastening them with a tenacious composition, but this method, though useful in ordinary bookwork, is not so for plates with illustrations in them, as they cannot be easily removed for underlaying.

CHAPTER LXVII.

THE MANAGEMENT OF ROLLERS.—How to Test them—How to Keep them—How to Wash them—Effect of Heat and Cold and Dampness—Selection of Rollers for various Jobs—Common Defects and Remedies—General Hints.

Good printing is impossible unless the rollers be in good order. It is therefore necessary for every pressman and machine-minder to study well their peculiarities and the best method of treating them.

“Green” rollers, *i.e.*, rollers newly cast, should never be used; if made of treacle and glue they should, whenever practicable, be kept at least a week to ripen. The greenness of even one of the inking rollers on a machine will spoil the work; the ink will lose brilliancy, and the impression appear dull and wanting in sharpness. Especially will this be so in the case of cuts.¹

A roller should be elastic without being too soft. A very soft roller loses its face and leaves small particles of composition on the ink table and on the type. Elasticity is one of the essential features of a good roller.

A roller is in good condition when it is neither too dry nor too moist. When touched, it ought to give a slight sense of attraction without in any way adhering to the fingers. If the hand is passed over it, there should be no tendency to abrasion.

The “tack” of a roller is its clinging propensity. This

¹ The ripening of a green roller may be hastened by rubbing it well with turpentine, which should be allowed to dry.

is due to the moisture absorbed and retained by the treacle, the sugar, or the glycerine which enters into its composition. A good roller should have plenty of "tack," and should shrink as little as possible as it grows old.

If by getting too dry a roller loses its "tack," it should be kept for some time in a warm, damp atmosphere, or if the composition is of treacle and glue it may be rubbed with a sponge dipped in warm water.

Rollers are much affected by heat and cold, and by the dampness of the air. They should be kept in a cupboard, in a horizontal position, the cupboard being fitted with racks on which to lodge the stocks. Press rollers should be suspended on rods passed through their cores, and resting in the racks. The cupboard should be in some part of the printing office least exposed to variations of temperature. It is well to place a trough of water at the bottom of the cupboard. This can be taken out when the weather is damp.

In cold weather rollers will want warming. They may be held near a fire, being constantly turned the while, or sheets of paper may be heated and successively wrapped round them; but the best way of warming them is to gently warm the ink table by means of candles, lamps, or gas jets, and run them upon it for some time before beginning work.

In hot weather, on the other hand, they will often get so soft as to be unworkable, and will occasionally show signs of leaving the stocks. They should be kept, if possible, in a cool cellar with a free draught of air playing upon them, and when in use must be frequently changed. Sudden cooling spoils a roller.

It is always economical to have two sets of rollers ready for each machine, and three sets are better than two, especially in warm weather.

The diameter of the inking rollers should be large, for

then the surface travels less frequently over the forme. On the other hand, the diameter of the wavers should be small; for the oftener every part of their circumference is in contact with the table the better the ink will be distributed.

Riders, *i.e.*, rollers working on rollers, materially assist distribution and good inking; they are found in all cylinder machines of the highest class. The use of these makes the impression lighter and sharper. They continually regulate the addition of the ink to the surface of the inkers, and this complementary distribution gives greater brilliancy to the ink. If proper riders are not available, metal rods, turned and polished, may be used. Old machines may be made available for riders by heightening the cheeks of the roller forks.

Inkers should be set so that they just touch the ink table: if there is too much friction the inking will not be good and the rollers will wear out quickly. Each roller should be turned round to see if it runs truly on its axis: if it does not and it must still be used, set it to the smaller side.

The best inker—that is, the one with the most tack on it—should be placed in the forks nearest the cylinder. It regulates the inking and clears off picks, cleaning the forme, in fact, before it receives the impression from the cylinder.

When the forme does not extend the full width of the bed, a little vaseline or lard should be put occasionally near the edges of the ink table to prevent the ink there becoming hard and injuring the surface of the rollers. If the ink is stopped off in the duct so that the ends of the rollers get none, put a little oil on the edges of the table.

Rollers should never be allowed to strike against the edge of the ink table, or the edges of pages in a forme; if they do so they will soon be ruined. To prevent this the roller lifts should be packed, if necessary, as shown on page 748. So far as the ink table is concerned, it ought not to have

any sharp edge, and if it has when it is delivered by the machine maker, its edges should be rounded or gently sloped by means of a file.

Never have any grease on the roller bearers; if the lifts slip, put chalk on the bearers.

Selecting Rollers for a Job.—In selecting rollers for a job, two general rules should be borne in mind: (1) a large poster or newspaper forme, or any large forme with old type, will require *soft* rollers with much suction; (2) bookwork, woodcuts, half-tone blocks, or fine job work, require rather *hard* rollers with a very smooth, elastic, and clinging surface.

For black inks, the hardness or softness of the roller will depend much upon the body of the ink, and even the quality of the paper to be printed on. Hard rollers should be used with stiff ink, and soft ones with soft ink.

Mr. Noble, the author of *Colour Printing*, says: "In black printing, where the operative has to deal chiefly with type formes, the sort of roller mostly required is one a few days old, and not too 'fresh.' Freshness is here understood as meaning dampness. If a roller be too fresh, there will be a difficulty in distributing even eighteenpenny ink; while if the highest-priced black be used, the roller will not pick up the ink at all. Again, when a roller is too fresh, although the ink may be distributed, the forme is 'wiped' in rolling, *i.e.*, the roller is so damp and tacky that although it may lay the ink on in rolling the forme one way, it removes, or, as it is technically termed, 'wipes' it off in rolling it another. Damp or fresh rollers are therefore useless, more especially if they are new ones, when we have to deal with stiff ink. When there are none but very new rollers available, they should be washed in turps, and placed in a current of cold air.

"In dealing with very small type or with fine engravings, we want a roller about four or five days old, not damp, but

having unimpaired all the elastic qualities of the composition; if the roller chosen is too fresh or damp, it will be seen by the greyness of the solid parts of the engraving. When a roller is in good condition for first-rate cut work, it should pick up the stiffest ink without difficulty, and transfer it in its fullest intensity to the forme. When weak or thin ink is used at press, it is always possible to use fresher rollers than if stiffer ink were used; indeed, it is frequently desirable to do so, because in proportion as the ink becomes thinner we must depend upon the extra sharpness of our rollers to keep the work clear. When rollers become hard or skinny, they have lost the qualities which fit them for fine printing; neither small type nor fine engravings can be properly printed with rollers of this description. In all those cases, therefore, where fine work is to be kept clean, sharp, good rollers must be chosen. Care must be taken that they are not too new and too fresh on the one hand, or they will fail to take up and distribute the ink; nor too old or too skinny on the other, or the work will clog and soon fill up. When rollers are very damp and green, they refuse, when the ink is stiff, to pick it up at all; and when the ink is not stiff, a very damp new roller only takes up the varnish, leaving the colouring matter behind, the ink thus only printing a stain."

Rollers used for coloured inks require a firmer face than those used for black. They should never be sponged just before going to press, as water deadens coloured inks, and causes many—especially vermilions—to precipitate on the forme. Where much coloured ink is used, sets of rollers should be kept exclusively for that purpose; not only because such inks require a tough, clinging face, but for the reason that a roller which is used for black cannot be washed sufficiently clean to prevent it from tinting reds and other lighter shades of colour.

Different coloured inks require different kinds of rollers:

some moderately seasoned, some very much seasoned. Information on this point with respect to each kind of coloured ink will be found later in this work in one of the chapters on colour printing. We may, however, state that red ink must never be used with any but well-matured rollers. Copying ink is very destructive to rollers; a single job in it often renders them useless. Where there is much of such work, a set of rollers should be kept for it.

The Washing of Rollers.—More rollers are washed out than worn out.

Never wash a newly cast roller; and there is no need to wash it before it first goes to work.

Never wash rollers oftener than is necessary, and then be most careful in the washing.

Many printers wash their rollers with lye; this is a good cleanser, but it is very bad for the roller. Turpentine is better, but for all ordinary purposes oil or petroleum is best; indeed a roller maker in a large way of business recommends that nothing else should be used. Many pressmen like benzine, but this roller maker says it destroys rollers fast by absorbing the saccharine matter.

Remember that washing or even touching rollers made of the glycerine compositions—and in these the “Durable,” the “Acme,” and other patent compositions are included—with water or lye ruins them. Try the effect on a piece of composition: you will find the surface either crack or swell immediately and so be ruined. The best plan is to “sheet” them every evening, and if the ink on them is stiff, they may be lightly greased with oil. Cleansing is only to be resorted to in the case of such rollers when they are really dirty, and then petroleum, or, as some prefer, a mixture of turpentine and petroleum should be used.

Rollers not intended to be used again soon should be smothered with thin, cheap black ink, and in this state

placed in the cupboard. This ink should be removed by scraping and washing before using again.

The best way of cleaning a roller is this: First take as much ink off as you can by sheeting it with wasters, then saturate a sponge or soft rag in the cleansing fluid, and rub gently but firmly from one end of the roller to the other, turning the roller from time to time. Do not begin at the middle and work both ways; by doing so the middle is likely to get twice the washing that any other part gets, and the roller will become hollow in time. If you use benzine or turpentine, and the roller be of treacle and glue composition, follow with a sponge damped with clean water, and finish by removing the water or cleansing fluid from the roller, and especially the ends, with a dry cloth or sponge.

If, contrary to advice, lye be used, as soon as the ink is loosened rinse with cold water, until not a trace of it remains on the roller, then wipe perfectly dry with a clean sponge.

Rollers should never be put away with coloured inks on them, as they generally contain driers and will cake and harden. Benzine will sometimes remove coloured ink when turpentine fails, though in general the latter is better.

General Hints.—A roller made of the treacle and glue composition may be made all the more serviceable if, a few minutes before it is put on the machine, its surface is rubbed over with a damp sponge; care must be taken to leave no lines or drops of water on it, and it should be dried before being put to use.

When the surface of a roller made of ordinary treacle and glue composition shows signs of going, it may be restored for a while by washing with a sponge dipped in very hot water and letting it remain for some time in a dry place. If the roller be made of a composition which will not bear washing, there is nothing for it but to recast.

Another way of renewing the surface of a roller which has just commenced to go, is to take off the ink and then wash

it with a sponge dipped in a medium solution of borax. It should be then left in the rack for a day or two before being put on the machine again.

A glazed roller—that is to say, one whose surface has got hardened and glossy, which is often the effect of washing with too strong a lye—is useless. It splutters the ink instead of depositing it on the forme in the quantity desired. There is generally nothing for it but to recast.

Old rollers, too hard and dry to use, can, however, sometimes be renovated and made to do good service by giving them from time to time a coat of glycerine after washing. Rub them well with the hand, let them stand a day, or as long as the condition of the roller may require, then sponge off and allow them to dry to the right suction. If they appear at all damp when required for use, roll them over some calendered paper to get the moisture absorbed. Where there is an excess of moisture in rollers, washing in alcohol will help to remove it.

If you have to work with bad damp rollers it may be necessary to dry them by rubbing them with powdered magnesia. Do not use alum.

“Friars” and “monks” are nearly always the result of rollers which are either too hard or eccentric, *i.e.*, cast with the stock out of the centre. Rollers, too, that are of too small a diameter do not sufficiently ink the formes, and consequently give bad impressions.

A simple device of the old pressmen, when they had a job to work with a hard roller, was to spit half a dozen times on the ink table, distribute, and beat the roller from time to time on the table to soften it. The operation would take perhaps ten minutes.

An American writer says he finds rollers cast in cool weather last infinitely longer than those cast in the heat of summer, and advises that as few should be cast as possible when the temperature is high.

Common Defects and Remedies.—The following defects and remedies may be enumerated. It is assumed that the rollers are of the treacle and glue sort :—

1. The rollers may be too hard.—*Remedy.* If too hard from the beginning, they must be recast, and less glue used. If from the effects of cold, warm them in front of a fire, turning them round all the time. If from being too old, recast them.
2. They may have a skin over the face.—*Remedy.* Rub them with a damp sponge five or six minutes before they are wanted.
3. They may be too soft or “green.”—*Remedy.* Hang them up again, put on balsam of copaiba, or wash them well in spirits of turpentine, and let it dry in.
4. They may be too dirty, and cannot be properly cleaned in the ordinary way.—*Remedy.* Slightly warm the face before the fire, and put a little oil upon it while warming. Wipe the oil and hard ink off, and wash the face well with turpentine.
5. They may be “greasy” and make friars.—*Remedy.* Rub them with a mixture of spirits of turpentine and water.

CHAPTER LXVIII.

PRINTING FROM HALF-TONE PROCESS BLOCKS.—How Half-tone Blocks are Produced—How Treated by the Pressman at the Hand Press—at the Cylinder Machine—with Coloured Inks—the Keeping of Process Blocks—Line Blocks.

BEFORE giving instruction in printing from half-tone process blocks it will be well to state very briefly how these blocks are made, for unless their nature be fully comprehended by the pressman he cannot perform his work with them with intelligence, and they now form a portion of the printer's plant almost as important as his types, for their cheapness and rapid production have caused them largely to supersede woodcuts, and to permit of illustrations which otherwise would be impossible.

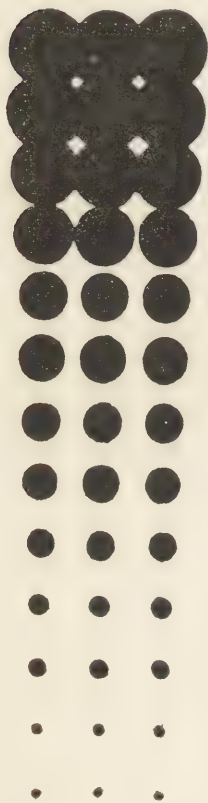
Half-tone process blocks are the result of an invention of Herr Meisenbach of Munich, made about the year 1882. What but for his process would be an ordinary photographic negative is broken up into dots of varying magnitude, and a print from this dotted or stippled negative is obtained upon a smooth surface of zinc or copper, which is afterwards etched with an acid, the white parts being eaten away and the various sized dots being left. It is these which receive the printing ink and give the impression.

The breaking up of the picture is performed by putting in the camera just before the sensitised plate, which is to become the negative, a glass screen ruled with crossed lines. Such screens have now been brought to great perfection, mainly by Levy of Philadelphia, and the best

cost large sums of money. The lines number from 55 to 200 to the inch—those for newspaper work ranging from 60 to 85, those for the finest art work ranging from 160 upwards, and those for ordinary work ranging from 120 to 135. Obviously the more the lines the finer the dots will be and the more perfect the picture, but correspondingly the more difficult will be the printing.

The following is a short description of the making of a half-tone block: The drawing, photograph, or other picture is placed on a vertical screen, and then by means of a camera and powerful arc-lights it is photographed through one of the ruled screens mentioned, a stippled negative being the result. Then a polished plate of zinc is evenly covered with a sensitising solution and dried, and after the negative has been developed and fixed in a dark room, the plate is put under the negative in a photographer's printing frame and exposed to the rays of a powerful arc-light. Overprinting is guarded against by watching the effect of the light on sensitised paper, placed close to the negative. The printing being accomplished, the plate is rolled with transfer ink and turpentine, and then developed with water, the parts of film on the plate not acted on by light being removed by gentle rubbing with cotton wool. An artist now retouches the negative plate if any part is defective, and the plate is then put in a bath of nitric acid, which etches it, biting away all parts not covered by the film. The plate, having been sufficiently etched, is now handed to a printer, who, with a hand press, pulls a proof from it. If any part seems to require amendment it is operated upon by a skilled engraver with his graving tools, and in any case he cuts out parts which should show up white. The plate is then passed to a router who, with a fast revolving drill, cuts away all parts not intended to show, and this done it is mounted or fixed on a block of hard wood so as to be type high. It is now ready for the printer, and on examining it with a

magnifying glass it will be seen that where in the drawing the parts are blackest the dots are so large and close together that they run into one another, and that where the light parts in the drawing appear the dots are fine and far apart, the varying size and spaces between the dots giving the gradations in tone.¹



The annexed illustration shows a small part of a half-tone block greatly magnified. The difference in the size of the dots and the way in which the largest dots run into one another will be observed, and the effect can be estimated by looking at the illustration from a considerable distance.

As the dots are produced by very fine points of metal, the white parts being eaten away with acid, it sometimes happens that in taking electrotypes of the original blocks the wax in the mould gets under the dots during pressure and some of these get torn away when the mould is removed. Hence electrotypes of half-tone blocks are often not so satisfactory as those of engravings, and the best work is done from the original blocks.

For the printer to do full justice to half-tone blocks requires (1) a high-class press or machine in perfect condition, which will give a quite even and rigid impression; (2) soft-sized paper of a high grade, with a beautifully finished face; if double-surfaced or

¹ The reader who wants detailed instruction in the making of these blocks is referred to such books as *The Half-tone Process*, by Julius Verfasser, and *Half-tone on the American Basis*, by William Cronenberg, both published by Percy Lund & Co. at 2s.

enamelled so much the better, but the enamel should be dull, and should not have been brushed so as to be made to glisten ; (3) the finest ink, whether black or coloured, stiff yet soft and velvety ; (4) hard, well-seasoned rollers, of the glycerine type, accurately cast, and with unimpaired surfaces ; (5) the most ample distribution ; (6) the most thorough inking, with just the right quantity of ink ; (7) a very hard-packed tympan, platen or cylinder, as the case may be, in perfectly even condition ; and (8) just the right make-ready.

On the subject of the make-ready opinions differ. It is of course universally admitted that blocks or plates must be evenly type high and rigidly mounted, but whether they should be underlaid or overlaid or both is a matter of discussion. Most printers underlay with hard paper, if necessary, to obtain a perfectly level surface, and then overlay to get the proper gradations of tone ; yet there are some, and among them men who have produced strikingly beautiful work, who insist that all the making ready should be in the underlay, no overlay being used. When overlays are made they should be very thin, made with hard paper, and carefully graduated at the edges ; they may run to three or even four thicknesses, and of course they must be fixed up very securely and very accurately.

Taking Proofs of Half-tone Process Blocks.—Mr. Noble, junior, who had a great experience with some of the first makers of process blocks in London, described in the *Printers' Register* his methods of proving the blocks. After stating his preference for an Albion press with a satin tympan and discussing the necessity for a perfectly rigid and even mounting surface, whether of board or iron, he declares his decided preference for fine paper with an extra coat of enamel, and continues : " Important as the paper undoubtedly is, it would not be of much utility if a cheap and unsuitable ink were used. Here the best the market can produce will no doubt be found to be the most economical in the long run. A

hard ink, not far removed from litho ink in body, and which when used gives a rich, velvety black and dries rich and velvety, is what is wanted. Of course there are blocks where a bright ink would be out of place, notably those made from chalk drawings, which should be proofed in a greyish ink, and, by the way, very little of it used. Line blocks as a rule should also be proofed in this ink, as grey-ness improves them. But these exceptions are not many, and the proofer, if he has any artistic knowledge at all, and is given a chance of seeing the original, will readily discriminate. To manipulate this hard ink, see that you have got the right rollers. Do not attempt to use the ordinary printer's varieties, as they will not do at all; they are too soft and 'fresh' when new; and even when they are, say, a twelvemonth old, and are sufficiently dry and tough, a damp wet day is enough to render them utterly useless; for few things have a greater capacity for absorbing moisture than a patent roller. Now, gelatine is quite unaffected by changes in the atmosphere, and is of the right consistency; that is to say, it is hard without being glassy, and, in our opinion, is the best known substance for these rollers.

"With the press level, and the ink and paper what they should be, the proofer's task should be an easy one. In the case of most of the ordinary square blocks, his second impression should be his finished proof, though of course vignettes are not included among these—they take longer and require more skill. Let us now suppose we have to proof a few blocks of a varied character, and see how they are to be done. We take an unmounted half-tone about 6 by 8. Before inking it up, we touch it over with a dry brush—this removes dust and metal chips and helps to keep the roller clean. Having rolled it up and placed it in the centre of the mounting board, we lay a piece of proofing paper on the top, and then two or three sheets more paper, with a piece of hard glazed cardboard, and

take the impression. With this impression we see what is required in the way of underlay, which we supply, and then clean the plate with turps, dry it well and carefully remove all pieces of fluff and rag. Then pull again, and this time, if it has been rolled up intelligently and the weight of the impression accurately judged, the proof should be as good a one as can be got from the plate. We next deal with a mounted vignette about 6 by 5. Whipping off our mounting board and seeing that the bed of the press is clean and smooth, we lay upon it from four to five sheets of well-glazed paper, and on these the paper, enamelled side up, for our first impression. Then, having inked up our block, we lay it face downwards upon the paper and pull it upside down. By this method an extremely hard impression is obtained that gives the unprotected edges of the vignettied block no chance to dip. Our pull shows that the edges print hard, while the solids in the centre require a deal more pressure to make them print firmly. To remedy this we underlay it in much the same way as ordinarily, but with this difference, that the underlay must in this case be what we may call an exaggerated one; that is to say, one must patch up the solids and throw away the edges to about three times the extent that would be required were the block to be pulled face upwards in the ordinary manner. A little practice is no doubt required in 'feeling' the impression, as in this case a very little difference one way or the other will spoil the proof. But when the necessary skill has been acquired, this method affords the means of obtaining good proofs in a very short space of time. All vignettes, however, are not susceptible of this treatment, as sometimes parts that require a good deal of impression are in too close proximity to soft edges that require hardly any. These have to be pulled face upwards and the edges made soft by a little rough overlaying on the tympan. This can

be well done with two sheets. In the first, cut away the edges to the extent of a nonpareil, and in the second tear the edges roughly round; while to obviate any suddenness, place a few sheets of tissue paper next the block when the proof is pulled. A little billiard chalk placed on the edges after the block has been rolled up will also assist in obtaining a quick proof of a vignette. This may not sound legitimate, but there are tricks in every trade."

Proofs obtained in this way can be had in fifteen to twenty minutes.

It is not many printers who will have to prove process blocks for the makers of them, but not a few may have to do so for their own satisfaction ere they proceed to print long numbers. Moreover, the hints given may assist young machine-managers in dealing with this important class of work. We therefore make no apology for reproducing Mr. Noble's instructions.

Printing Half-tones on Cylinder Machines.—The requirements enumerated in the early part of this chapter will show what is wanted, but we now reprint from the *Inland Printer*, of Chicago, the substance of a paper by an American printer, whose treatment of these illustrations produces much admired effects. Prefacing his account by the statement that though his methods bring about acceptable results, he does not dogmatise that they are the best or indeed necessarily correct, he thus describes his procedure: "I obtain all the cuts on a certain piece of work from the composing room before they are made up in the formes, and of each cut I have proofs taken on different weights of double demy paper, 60, 70, and 80 lb., and then proceed to make cut underlays. Taking one of the proofs on the 70 lb. stock, I carefully trim it all around, leaving a margin of one-sixteenth of an inch of blank all round the print. I then cut out of the sheet all of the extreme high lights, being careful to cut a little of the surrounding

shadows with them, the purpose of this being to prevent too much impression on the point of division, which would have a tendency to bring up the shallows. I then take the proof on the 80 lb. stock, and remove from it the extreme blacks and solids, always cutting a little inside the line, and paste them on the 70 lb. sheet already treated, using common flour paste or mucilage. I then take one of the proofs on 60 lb. stock, and cut out all of the intermediate shades, such as should appear lighter or softer in the finished print. I take these several proofs and paste them together, and then I have what would be called a four-ply cut overlay, excepting that all of the pieces comprising it are cut a trifle inside of the line. If the cut has more shade in it than can be properly treated with three sheets, I take a 50 lb. paper in place of the 60 lb., and add one sheet to my underlay, treating it in the same way as the second sheet with the exception that, instead of cutting out the extreme solids, I remove all the semi-dark shades as well, and paste them on. Having made my underlays in the manner described, I proceed to unmount the cuts from their bases. In order to do this without injuring or scratching them, great care is required. The tools I find to be the most advantageous are a small hammer, a pair of pliers, and a small chisel—this last should be about a quarter of an inch in diameter at the shank, and should have a long tapering blade, and be about half an inch wide at the extremity of the blade. Some small wire brads, such as are commonly used for mounting the plates, a prick punch, a small-nail set (small hammer, punch, pliers, etc.), an electrotyper's iron finishing plate, and a pair of plate calipers, such as are used by electrotypers, are the other requisites. Having removed the plate from the block, I take the calipers and make at least two distinct points on the back of the plate in order to be able to paste the underlay accurately in position. This done, I lay the cut face upon the iron plate, and with

a small boxwood planer I go over the entire surface, taking care to strike only a moderate blow. I take the block thereafter, and examine it carefully to see that it is free from lumps and rough places, and mount the cut on the opposite side to that from which I took it, and send it to the composing room.

"This method, I find, saves a great deal of time in the final make-ready of the forme, as it is only necessary to even up the impression on the cut, and the underlay will throw the lights and shades where they should be without any further care on the part of the pressman, and for long runs will preserve the cut much better than if a plan of overlaying was followed. It holds up to the rollers the dark parts of the cut, properly supplying them with ink, and protects the lighter and more delicate shades from receiving unnecessary pressure."

Half-tones in Colours.—It is now very common to print half-tone blocks in coloured inks, but to our mind none do them justice so well as black, except perhaps the various photo-browns. Maroons and dark greens give good effects, but bright, light colours should be eschewed, and whatever inks are used they should be free working, as most of those compounded with lakes are, and of the best and finest description. Ochres and other earth pigments must be avoided, for they fill up the fine work in the blocks. Ultramarine too always works thick, and therefore when blue is wanted, one composed of cobalt or cyanide of iron is to be chosen.

It has been said that if the inks and rollers are in proper condition, and the distribution right, and yet the work prints "speckly," the cause may be that the inking rollers are a trifle too low.

Line Blocks are produced photographically from line drawings, in the same way as process blocks are made, only in this case no breaking up into stipple is required, and con-

sequently no lined screens are introduced into the camera. The lines in these blocks are solid, and the blocks themselves are dealt with by the printer like coarse wood engravings. These blocks can be printed on low-grade papers, and do not require a calendered surface. They are therefore eminently suited to newspaper printing, and are mainly relied upon for the illustrations in the *Daily Graphic* and *Daily Chronicle*. They stand more overlaying than half-tones, and the packing of the cylinder need not be so hard as is necessary in the case of these.

The Keeping of Process Blocks.—Most half-tone blocks are made of zinc, and as this metal rusts with the application of the least moisture, it is necessary to keep them in a dry place and to handle them with care, for the ordinary perspiration of the hand is sufficient to impair them if it be not wiped off. For the rust eats into the metal, and the fine work gets destroyed. Mr. Wood Smith and Mr. Martin drew attention to this in the *Printers' Register*, and recommended that when such blocks were to be put away for a considerable time they should first be coated with either shellac or bees' wax, which would prevent moisture attacking the surface. This can be removed by heating and the subsequent application of methylated spirit or turpentine. A sufficiently good and more simple method is to cover the surface of each plate with a layer of pure vaseline. The plates are then laid face to face, with some thick wrappers or papers between, and sent to store. Where, however, the blocks are frequently used, by far the best plan is to have them nickel-faced; the cost of this will be saved in a very short time.

CHAPTER LXIX.

TYPICAL WORK ON CYLINDER MACHINES.—High-class Bookwork from Types and Electros—the like from Plates—Common Bookwork from Worn Stereo Plates—Poster Work—a Forme of Rule Borders—a Country Newspaper Printed on a Single-side Machine.

IN this chapter it is proposed to state how typical work of various kinds and grades is produced on one-sided cylinder machines in modern printing offices. Methods here briefly referred to will be found described at length in previous chapters.

High-class Illustrated Bookwork from Types and Electros.—To illustrate how this work is done we give a description of the actual working of *Feilden's Magazine*, a very beautifully printed monthly magazine executed in the office of Messrs. Bradbury, Agnew & Co., Limited.

Machines Used.—These are generally high-class stop-cylinder machines of the Wharfedale type and of quad crown or quad demy size. But fine-art Wharfedales or two-revolution machines would obviously turn out equally good work more expeditiously.

Rollers.—These are of the glycerine and glue kind, well seasoned, such as are supplied by the Durable Roller Company, Parsons, Fletcher, & Co., and other firms.

Ink.—A fine quality of quick-drying black book ink is adopted.

Paper.—A good white art paper, quad crown size, 112 lb. per ream, is used.

Cylinder Packing.—The cylinder is packed with paper only, a 72lb. quad crown printing of good quality being used. The number of sheets on the cylinder varies according to the cylinder bevel, from eight to twelve and where there is a deep bevel even to sixteen. It is of course laid on very truly and taut, and made fast without a vestige of bagginess or wrinkle.

Working.—The machine having been found to be in first-rate working order and the bed clean and free from damp, the forme is dropped on the bed and planed down. The pitch of the machine having been duly found, two inkers are put in and an impression is taken on a sheet of its own; this is usually backed to test the imposition, and if that is found correct, another sheet is pulled for lay and register. As the forme has usually to be unlocked for this, the opportunity is seized to take out and level any blocks which are not of the proper type height. As a rule the blocks have already been through the machine-manager's hands, and he has applied to each one of the gauges for height already mentioned, and where unevennesses have been found the blocks have been levelled and treated as directed on page 695. Occasionally an underlay is inserted between the mount and the plate, but only in the case of a very heavy subject or a badly-mounted block, and it is seldom required when good electros are used.

Underlaying being finished, and lay and register found correct, the machine revise is pulled so that if any batter has been made or any type has dropped out while underlaying the defect may be detected.

Overlays have already been made by the machine-minder, the blocks having been entrusted to him for the purpose ere they were inserted in the forme. He has therefore to look them out from the portfolio in which he keeps them. They have been made with special reference to the class of machine and the fineness of surface of the paper used.

Thin overlays in three or at most four grades are found best, a 30 lb. double demy being generally used for the purpose, though in the case of some half-tone blocks thin, hard writing paper is preferable.

Correction of the forme on revise having been made, an impression is pulled on the cylinder, weak places, if any, are filled up by patching and heavy places lightened by cutting, and this finished the overlays are stuck on, care being taken to see that the covering sheet is thoroughly dry, for if there is the least moisture in the sheet it will contract, spoiling the effect of the overlaying. It is of course understood that all *make-up* is done from the back of the sheet showing the impression. The patched sheet is now cut into pieces containing not more than two pages each, and these are pasted and stuck on the cylinder sheet, the ends nearest the grippers being pasted. An outer sheet, which has been slightly damped by keeping it between some wetted paper for a few minutes or by lightly sponging it after it has been pasted at the gripper edge, is now put on the cylinder, and while it is drying, and thereby shrinking and tightening, the ink slab is washed and the rollers adjusted, the vibrator being cut if necessary to suit the blocks in the forme. The flyer then receives attention, and, the whole machine being found in order, the colour is run up; waste sheets are now fed in and then a good sheet of its own, followed by a thin sheet. This last is for final patching should the pull on the good sheet show the need for any, and in some cases it is necessary to pull a second thin sheet and use it to take the solids of very heavy blocks. Now a final outer sheet, slightly damped, is put up, the ink slab and iron riders are again washed up, and when all is dry the printing off is commenced.

Good work of this kind is delivered by the flyer into trays, so that there is very little fear of set off through the paper being lifted off the machine. When a tray gets from 200 to 250 sheets it is removed, and another is substituted.

When the printed sheets come to be backed, if there are any heavy cuts or if from shortness of time there is any chance of a set off, the outer sheet on the cylinder is rubbed over with a sponge or soft rag dipped in glycerine or oil, so that the ink on the printed side of the paper may not adhere to it. This process may have to be repeated if the run is long. No more oil or glycerine is to be used than is sufficient to permeate the top sheet.

Same Class of Work from Electro Plates.—Here the pressman must see that his mounts or mounting-board are true, and that each plate sits tightly on it in its proper place. The position of the row of plates nearest the cylinder must first be defined, regard being had to the pitch of the cylinder and the margin required; then the distances between the plates must be accurately gauged. For this purpose the metal gauge, the straight-edge, and the T-square will all be required, and when the plates have been duly located they must be fixed with the clamps or with screws. The other rows must be similarly located and fixed. That there may be no mistake as to margins, it is usual in large houses to have the first forme made up in the composing room. The plates having been duly located, and the cylinder having been packed as before, a pull will reveal whether any and what underlaying is required; and a second, backed, will show if any plate must be readjusted. Underlaying is performed by removing the plate required and inserting between it and the mount a graduated underlay, made something like an overlay, care being taken that the double thicknesses come under the solids. This done, the make-ready and other work proceeds exactly as in the case of printing from type.

Common Bookwork from Worn Stereo Plates.—Here a lower class of machine may be employed; and rollers of treacle and glue will do quite as well as those of the patent compositions. The cylinder packing must not be hard, either soft paper being employed or a blanket, or both. The

ink will be of a less expensive kind and thinner than that used in the first example ; and as for the paper, an ordinary uncalendered printing wetted down will give best results, though it may be worked dry. Naturally, the plates must be located with care in the manner stated in the last example ; and, if necessary, there must be underlays and overlays, though the time spent on them will be comparatively short.

Poster Work.—The forme in this case will be generally dropped so that the lines of type run at right angles to the cylinder. The packing will be soft or semi-soft, according to the size and sharpness of the type and the quality of the paper to be used ; the better these are, the harder the packing may be. So, too, if the type is worn, the ink must be thinner than it need be if all is in first-rate order, and the rollers must be rather soft. The heavy lines or letters must be overlaid to give good results. Double rolling may be found necessary.

A Forme of Rule Borders to be Worked in Red.—This will always be found troublesome work on a cylinder machine, the large blanks in the forme giving a decided tendency to slur or crease. Hard packing is essential ; and, in working, each sheet to be printed must be kept as close to the cylinder as possible.

A Country Newspaper on a Single-side Machine.—This kind of work is too often done in a slovenly manner, want of time, so commonly pleaded, not always being a valid excuse. A second-class machine is generally considered good enough, and rollers of either kind will do. The cylinder packing will vary from semi-hard to soft according to the condition of the type, blocks, and paper used. It is generally worth the while of the owner of the paper, especially if he be a jobbing printer also, to use the best materials and give the best make-ready he can afford, as the appearance of the newspaper affords some indication of the character of the other work he turns out. Hence, where

comparatively new type and unworn electros are employed, a smooth-surfaced printing paper should be adopted, and the cylinder patched with care, some sort of overlays being given to any cuts in the forme, though usually the only make-ready is a levelling up under the blanket. Old type and worn electros show least badly on ordinary printing paper worked damp with a soft packing.

CHAPTER LXX.

VARIOUS KINDS OF PRINTING.—Printing on Hard Papers—Printing on Parchment—Printing on Satin—Printing Heavy White Letter Blocks.

Printing on Hard Papers.—Hard papers are usually hand-made writings, and are made from linen rags, bamboo, silk, and other substances. They are often loft-dried and triple-sized, and when glazed are frequently calendered by very hard pressure between polished metal plates. It is obvious, therefore, that such papers require different treatment from the ordinary half-sized printing papers. We condense from an article by Mr. W. J. Kelly the following instructions for printing on such papers :—

For printing on the highly-glazed papers you must have good type, good rollers, and fairly strong and quick-drying ink, very hard packing, and a light make-ready. The rollers should impart only just enough ink to give solidity to the colour. There should not be the least indentation of the paper.

Papers having a rough or uneven surface of face and back require a special make-ready, which must not be so hard as that used for smooth paper, but must not be too soft either. Such paper cannot be properly printed upon without showing more or less impression on the reverse side. When working at a cylinder machine the packing should be of soft book paper covered with a stretched sheet of super-calendered paper. When a platen machine is used the same kind of packing will do, but if a sheet of

80 or 100 lb. blotting paper is inserted near the face of the platen a much better result can be got. When the ridges or depressions in the paper are very deep and the surface is rough, as is usually the case in the thicker grades, the packing should be somewhat softer than for a lighter weight of the same kind of paper, and the impression made rigid enough to press the forme solidly on to the paper.

The inks used for hard-made or hard-finished papers should be full coloured, of medium body, and containing a quicker drier than that usual in ordinary jobbing inks. Inks made with strong varnish do not work well on such papers.

The rollers should be well seasoned and have a quick and flexible touch, with just sufficient suction to take hold of the ink instantly and thoroughly distribute it, care being taken that only enough ink is carried to cover the forme solidly. All the rollers should be set as lightly as possible.

Printing on Parchment.—According to *Dumont's Vade Mecum* the skins should be interleaved, skin by skin, with paper somewhat larger, which has been moderately damped. The paper must be good and homogeneous, and be evenly damped. The parchment will soon lose its stiffness, and as soon as it has it is fit for printing on. The damping does not require more than ten minutes, and it is very important that it does not continue longer than is necessary or the parchment will be discoloured. When printed, place each skin between sheets of dry paper and press between boards till dry.

Printing on Satin.—The satin should be stretched dry on cardboard, and its edges fastened with strong paste. It should be worked at the hand press, and the dwell on the impression should be longer than usual. If the lettering is to be in gold, print with gold size and glair and afterwards use gold leaf, not bronze.

Printing Heavy White Letter Blocks¹.—The printing of the heavy white letter blocks now so largely used for advertising purposes not unfrequently gives the machine-minder a large amount of trouble. We do not mean the common poster work, but the more elaborate white letter tablets such as are used by firms like Messrs. Gilbey & Son. These are generally printed upon single-side machines, and they require special treatment. It is obvious that the printing of a double-demy white letter block is a very different thing from a double-demy forme of type. The many difficulties which present themselves may be summed up as follows: First, the block itself may not lie perfectly flat upon the machine, and this will cause it to rock as the cylinder goes over it, thus causing the furniture to rise, and creating blacks in the margin. Secondly, there is generally in this description of work, when it is not properly treated, a disposition to crease. Thirdly, on account of the great suction of the ink, there is always a liability for the sheets to pull out of the grippers as the cylinder is going over the impression. Fourthly, it is frequently difficult to fill large solid formes of this character without unduly attenuating and impoverishing the ink.

Blocks of this character are cut upon various descriptions of material. The commonest sorts are cut upon pine; but for the better class of work, seasoned sycamore is frequently used; while for really first-class work, requiring great sharpness of outline, the blocks are sometimes engraved upon zinc plates. This is, however, an exceptional method, only practised by large establishments that have the advantage of elaborate engraving machinery by which this kind of work may be done in a short time and at small cost. There can, however, be no doubt of the advantage of a harder material than the soft wood generally used for this purpose;

¹ This is from the pen of the late F. Noble.

and if the engraved plate be mounted upon iron instead of wood, all difficulties of rising of furniture and warping are at once abolished. It is true that the first cost of this method of procedure is larger than the former, but in cases where large quantities are required it is probably more economical in the end. In the example we are about to take we will assume that we have to deal with a double-demy block cut in sycamore, and that it is to be printed in rich chocolate ink on a single-cylinder machine of the same size.

The first thing which would demand the attention of the machine minder would be the condition of the block itself as to flatness. If he found that the block was at all warped it would be useless to lay it on the machine in that condition, and he would have first to take the ordinary means for getting it perfectly flat before he locked it up on the machine. When a large block like this becomes warped, the following is the method usually adopted to get it right : Supposing the block to have become so warped that the printing surface presents a concave instead of a flat surface, it will be necessary to thoroughly saturate a blanket, and place the block, face downwards, upon a flat board or the bed of a press or machine, then to place the wet blanket upon the back of it, then a wetting-board upon the top of the block, and a heavy weight on the top of that. This will soon bring the block round to its natural condition. Of course, if the printing surface of the block presents a convex appearance, this treatment should be reversed.

Having got the block perfectly flat, it may be locked up on the machine. The next question the machine printer will have to consider will be, what is the best material to put on his cylinder in order to work a job of this character ; and in considering this part of the subject, he must bear in mind that while he wants a soft impression to bring off the solid tablet firm and full, yet it must not be soft enough to

cause the whites to dip very much, or the consequence will be a crease which will be very troublesome indeed to get rid of. For instance, it would not do to attempt to work a solid block of this character with a very thick blanket, because wherever the white occurred the blanket would dip, and a crease would be the result. A very satisfactory method of dealing with this class of work is to paste from four to six sheets of thick paper upon the cylinder very tightly, and over these a thin blanket should be tightly drawn. This will give an impression soft enough to print the tablet solidly, while it will be too hard for much dip to develop itself; and even should a crease, caused by the dipping of the whites, show itself, the blanket may be raised and the parts which dip cut out of the sheets upon the cylinder.

In work of this description, which is required to be done very well indeed, and where it is desired to get the impression perfectly flat, it will be necessary to make an overlay of very thick paper, in which all the whites are cut out. Having pasted the sheets upon the cylinder and fixed the blanket, the forme may either be rolled with a press roller, or the colour run up and its own inkers put on, the latter being the preferable plan. When a sheet has been pulled, it will be necessary to underlay the block very carefully; and in doing this part of the work the machine minder cannot be too careful in avoiding a spongy sort of underlaying, for if thick, soft, uneven wrapper be used, the block will not lie flat upon its bottom, and will rock with the motion of the cylinder.

The best thing to use for underlaying blocks of this character at machine is thick, brown, glazed paper, which, when pasted all over, makes a perfectly flat underlay. Having taken careful note of the points to which attention has already been called, the pressman may place its own ink in the ductor with the view of getting a start.

As it is assumed that we are dealing with a block which requires to be printed in a full, rich, deep colour, the ink intended to be used must not be too thin, as a lack of body in the colour will give a poor and washy effect. To produce the best effect in this sort of work two things are primarily necessary—namely, good full-bodied ink and thoroughly effective rolling. It not unfrequently happens that when only moderately stiff ink is used for machine printing of this character, the sheets either break or pull out of the grippers as the cylinder is going over the impression; and it becomes a serious question how to prevent this without impoverishing the ink by thinning it down. Many expedients are in use in the trade for getting over this sort of thing, and on some machines cylinder brakes have been fitted specially with the view of meeting difficulties of this nature. These brakes are very valuable in their way, and check the speed of the cylinder just as it commences to take the impression. The cylinder thus moving slowly over the forme takes the sheet off gradually, in a very similar way to a pressman peeling his sheet from the forme at press. Another excellent plan for softening without impoverishing the ink used for heavy tablet work at machine, is to have a coil of gas-jets fitted under the inking slab of the machine; this keeps the ink in a half-melted condition, and by its assistance very much stiffer and consequently richer ink may be used than would otherwise be possible.

But although the automatic brake and the coil of gas-jets are the best adjuncts to a machine intended for heavy work, we must turn our attention to the more familiar modes of softening the ink, as represented by lowering oils and varnishes. When it is found that the ink being used is so strong that the sheets break in the grippers, and we have neither brake to the cylinder nor heat under the slab, the question naturally arises, What is the best material to mix with the ink in order to deprive it of its suction without

diminishing its body? For this purpose various substances are used in the trade. Sometimes very thin varnish is used, sometimes boiled or burnt oil, sometimes turps is added to the ink, and sometimes soap. For very common poster work either burnt oil or turps has the desired effect at once, and rapidly deprives the ink of its suction; but there is this objection to its use for good work—it is liable to spread from the edges of the printing into the paper, like writing ink dropped on blotting paper; this of course makes its use inadmissible for good work, except in the very smallest quantities. Sometimes a little of the thinnest thin varnish used alone may be found sufficient to moisten the colour enough to bring the sheets off the forme; but care must be taken not to use this in excess, or the printing will be motley and not solid. The best thing to use for the high-class work of this character is a little thin varnish with a small amount of soap, which will have the effect not only of easing the sheet off the forme, but of increasing the solidity of the printing.

The next thing of importance which calls for the printer's attention is the number and condition of the inking rollers proper to be used for the job we are now dealing with. It must be obvious that unless we get a thoroughly effective rolling it will be impossible to produce really first-class work. It would, for example, be useless to attempt to print a job like this with only three light inkers, which might answer very well for a movable type forme of the same size. At least four heavy inkers with two riders would be required to do justice to the forme, and even this rolling would in many cases be deemed insufficient, and, on ordinary Wharfedales, recourse would have to be had to the double-rolling facilities which most of the modern single-cylinder machines possess.

The principal peculiarities of the description of the work we are dealing with now have been examined in detail. It will be seen that the main points are to get the block quite

flat upon the bed of the machine, so that it may not be rocked by the cylinder; to see that the forme gets adequate rolling, by means of heavy and efficient inkers; that the ink is made just soft enough for the sheets to come off the forme without tearing in the grippers; and to note that the forme is thoroughly cleaned at each impression, *i.e.*, that there is no residuum of ink left on the block after the impression is taken.

One other matter calls for a few remarks. In block work of this character there is always a disposition, more or less pronounced, for the sheet to crease on the leaving part, and this creasing is generally caused by the dipping of some of the whites in the block. The machine printer may generally control this creasing by keeping the sheet as close up to the cylinder, on the entry, as possible, by means of pieces of cardboard fixed to his laying-on board and falling between the grippers. Failing this, the particular dip from which the crease starts may generally be seen, when the blanket should be lifted and the dip cut away. A thick overlay with all the whites cut out will nearly always prevent a crease in white letter block work, although, in obstinate cases, it may be necessary to dispense with the blanket, and work the job entirely with sheets, with a piece of thin glazed calico stretched tightly over the cylinder. It should be borne in mind that creases are, in these cases, caused by dipping, and that where the impression is flat a crease is very unlikely to appear.

CHAPTER LXXI.

SOME DIFFICULTIES IN MACHINE PRINTING.—Slurring—Imperfect Inking—Creasing—Irregular Gripper Action—Sheet not Lifting—Cockling of Sheets—Defects in Register.

WE will now deal with some of the difficulties which a machine printer frequently meets with in his ordinary work. These are often very trying and very puzzling, and much time is lost in endeavouring to overcome them. A few hints will be of great use to the learner, but he must not suppose that we can inform him of the way to surmount every trouble he will meet with. In fact, it is impossible for any one to anticipate all the vagaries of the plant and material which have to be dealt with, and even the most experienced men will be at a loss sometimes to account for what goes amiss.

Slurring.—This is one of the main difficulties of the machine-minder. It may arise as follows:—

First, from defects in the machine, as:—

1. Some portion of the driving gear which operates the table may have become loose.
2. The machine is not firm on its bed.
3. The brake is out of order.
4. The bearers are defective.
5. The bushes of the cylinder axis may be worn.
6. The feeding board may shift laterally.

Or it may arise from errors in working the machine, as:—

1. The cylinder not being set sufficiently on the bearers.
2. The packing being excessive, causing the circumference of the cylinder to be too great.

3. There may be too many overlays used.
4. The sheets on the cylinder may have become loose.
5. The forme is not tight on the table.

Imperfect Inking.—It sometimes happens that when about half a dozen sheets have been run through the machine-minder observes that there is a narrow streak of colour down four of the pages. He of course stops the machine with the view of ascertaining its cause, and his attention is naturally attracted to the ductor. He will probably find that the colour is coming out thicker opposite that part which shows blacker on the sheet. If this dark streak is not more than two inches wide, it will be useless to try and get rid of it by closing the ductor-knife, because this shows that the knife is not true in that particular part. It must be controlled by manipulating the delivery-roller (the vibrator). Carefully cut a piece of composition out of the vibrator roller, thus diminishing the supply of ink in the particular part in which it is in excess, and the difficulty will be obviated.

Impression Thick on Edges of Pages.—When the colour gradually works up too black, and the impression looks thick on the edges, the roller-lifts must be packed up, or, if this has been done already, the packing must be increased, but of course only in the gutters where the hard edges come. Cut a piece of wrapper or leather about a pica wider than the gutters, and tack a piece of it upon both sides of the roller-lifts exactly opposite the gutters, the wrapper or leather being bevelled off at each end, so that the inking rollers may run steadily over it. The object of this is that the edges of the pages may get the least possible rolling. Having run the waste again and pulled the sheet, it must be carefully examined to see that the rolling is all right, and that the pieces of leather which have been put on the lifts are not causing the rollers to jump, thus making a friar. This packing of the roller-lifts is a matter which must be attended to

with great care, and the pieces of wrapper or leather should be adjusted, so far as their height is concerned, with very great nicety. When it happens that any of these have been left too high, which will be at once seen by any part of the forme being devoid of ink, the piece of leather opposite that part of the forme where this occurs must be shaved off with a sharp knife, so as to allow the rollers to drop on to the edge of the forme, but care must be taken not to overdo it; the roller-lifts and packing upon them should be so nicely adjusted that the inkers run steadily and smoothly over them without a jump, the inkers doing little more than slightly touching the edges of the gutters.

Creasing.—This is a very troublesome difficulty, and one which often taxes patience to the uttermost. It occurs chiefly with thin paper, and more often where the packing is soft than where it is hard. It may be caused by the following among other things :—

1. The grippers not taking the sheet evenly.
2. The packing not lying close to the cylinder throughout its length and breadth.
3. The careless putting up of the overlays.
4. The action of the air, especially in formes containing rule borders, with a white space between.
5. In perfecting and other machines where tapes are used, by the action of the tapes.

Some observations on creasing and the modes of overcoming the evil have already been made on p. 785.

In work mainly consisting of rule borders or rule blanks, the printer should avoid altogether the use of a blanket on his cylinder, and use as few sheets for packing as possible. Paste these both at the entry and leaving edges, and draw them as tightly as possible; also contrive, if possible, that by means of some pieces of card, fixed to the lay-board edge, the sheet is scraped or pressed tight to the cylinder as it goes into the machine.

A crease or a slur may sometimes be prevented by tacking two pieces of narrow tape, one to the near, the other to the off side of the laying-on board, and passing these tapes under the cylinder to corresponding positions on the taking-off board, where they are tacked also. The object of them is to keep the sheet close to the cylinder while it is receiving the impression.

Cockling at the Lay Edge.—Sometimes when a job to be worked with damp paper has been long in getting ready, the paper may become dry at the edges, and consequently may not lie flat at the gripper-edge, thus causing the work to corner, in which case it becomes difficult for the boy to lay it on. This can be got rid of by spurting the edges with water, or damping them with a sponge.

Irregular Working of the Grippers.—This is another source of trouble. They bite irregularly, and when one is screwed up it seems to loosen the others, and sends the sheets into the machine all awry. The cure for this is to loosen all the grippers, and when they are loose, to examine how the spring is. Get it tight enough, then fix one gripper in its place, and gradually bring the rest up as tight. Put a piece of paper under each, and see if they all bite alike. This must be done gently; it is a simple operation when properly performed. When a gripper refuses to bite the paper, the difficulty may be overcome by sticking on to it (with paste or heated compo.) a piece or pieces of emery paper, which will be found to hold the paper firmly. There is usually on the machine a "set gripper," put there as a guide for the setting of the rest. It is generally on the near side of the machine, and is distinguished by a pin through it, or a dimple on the shaft.

Sheet not Lifting.—In printing a poster or a heavy cut job on a machine, the paper sometimes cannot be got from the type, as the ink retains it. In this case thinner ink must be used. It is a mistake to try to thin the ink as it stands in the ink-duct; another kind should be substituted.

Some machinists put a quantity of varnish into the ink, and stir it up with a stick or a palette knife. This generally spoils the ink or spoils the work. The only proper plan is to clear out the duct and put in fresh ink. If ink of the proper consistency is not at hand, that which has proved too thick may be thinned by the addition of a little boiled oil. In the case of posters, turpentine or paraffin may be used as well as boiled oil, or in substitution for it. In cold weather, warming the ink table will be found of great advantage; care must be taken, however, not to damage the rollers by too much heat.

Defects in Register.—The following are the chief causes of bad register of the second side :—

1. The laying-on board may not rise and fall with perfect accuracy. The slightest lateral play will spoil the register.
2. Play, or shifting, of the point frame.
3. Looseness of any of the grippers, or the smoothers; being down too hard.
4. The machine being driven at too high a speed.
5. Unequal speed.
6. The brake being too tight, preventing the cylinder getting quite "home."
7. The brake being too loose, allowing the cylinder to start.
8. The improper position of the forme on the bed. The position of the forme on the bed is, of course, a matter which ought always to be seen to carefully before any attempt is made to work off, or even to make ready.
9. The drying of the paper (when used wet) after the first side is printed, which drying causes it to contract. Obviously, therefore, when wet paper is used, it should be backed as quickly as possible.
10. The stretching of the paper when the first impression was made, either through the paper being too new, or the ink being too stiff.

CHAPTER LXXII.

SUNDRY MATTERS IN MACHINE PRINTING.—Position of Machine—Foundation—Lubrication—Cleaning—Precautions against Accident—Commencing a Day's Work—During Work—Washing-up—Requisitions for Paper—Method in Working—Cleanliness—General Duties and Responsibilities.

Miscellaneous Matters.—*Position of the Machine.*—In choosing a place for a machine, see that there is abundance of light. Good work seldom proceeds from a dark corner; and if artificial light has to be depended upon, there is a very considerable extra expense added to the working of the machine.

Let there be sufficient space around the machine to enable the attendant to have ready access to any part. A large proportion of the accidents that occur in the machine-room arise from overcrowding; and however valuable ground-space may be, it is most unprofitable to pack machines together so that they cannot be "got at" for oiling, regulating, or even inspection.

Foundation.—Every machine requires a good, solid, level foundation. If it be not possessed of this requisite, good work will be impossible, and the machine will "jolt" itself to pieces in time. The process of dissolution may be retarded by periodical "screwing up," but the machine is being worn out by vibration instead of work; and really good performance cannot be expected of it under such adverse circumstances.

Lubrication.—Before beginning to work a machine, care must be taken that it is thoroughly oiled in every part that

requires lubrication. The printer must acquaint himself with the position of all the oil-holes, and afterwards regularly attend to their supply of oil. This is a far more important matter than most persons unacquainted with machinery would imagine. A machine not properly kept in this way will do less work, and worse work, than it ought to turn out. It will frequently require repairs, and wear away before its time in some of its most important parts.

Use no oil which is liable to clog. Neat's-foot oil is excellent for printing machinery. If the holes are clogged, a few drops of paraffin oil very often dissolve the oil, and enable the holes to be cleared with a bodkin, an awl, or any other suitable instrument. The dirt should be removed with a little cotton waste.

While sufficient oil is absolutely needful, too much is detrimental. It is not only extravagant, but it makes dirt, and gives trouble unnecessarily. In badly-managed offices the floor under a machine will show a series of little pools of oil, with perhaps streams extending from them to beyond the frame. A careful machine-minder will keep the floor quite clean. Where there is not an oil-cloth or tin under the machine to receive any drops of oil that may accidentally fall, he will put wrappers or other waste sheets of paper, and on removing these sheets the floor will be as clean as though no moving machinery were working above it; but the tin or oil-cloth is preferable, as they not only look well but keep down dust.

Dust in a machine-room is a great obstacle to good work. It gets in the ductor and spoils the ink, surrounds the rollers and makes them work "scabby," and deposits itself on the forme, causing picks, for which the machine has to be stopped, and time lost, or the forme is injured. The floor should be thoroughly swept in every corner, the machine during the sweeping being covered with a cloth or newspapers.

Cleaning.—All parts of the machine should be kept quite clean, and the bright parts never allowed to rust. The coffin, or bed, must be kept scrupulously clean, and no dirt must be allowed to lurk in the corners. The work of cleaning the machine is too often left to boys, who do it carelessly or imperfectly, and cause subsequent stoppages by dirt getting on to the forme. The machine-minder should always satisfy himself that his bed is clean before he lays down the forme.

Precautions against Accident.—The cleaning or oiling of those moving parts of a machine that may do injury to the person employed in the work should never be done while the machine is in motion. If it is necessary to get within the frame of the machine, the belt should be thrown off the countershaft pulley before this getting in is attempted. The machine ought to be absolutely incapable of being put in motion by accident. Most painful mutilations occur in offices through the neglect of this simple precaution.

When anything is deficient, representation of the fact ought to be made to the overseer or manager.

The layer-on should never start a machine without giving a distinct intimation of his intention before he strikes on, and not simultaneously or afterwards. Many accidents are caused by the non-observance of this precaution.

Some young persons are disqualified by temperament for working at a machine, being so nervous as to be in constant dread of getting their hands entangled in the working parts. If, after a short probation at machine, a boy evinces this disposition, he should be removed from the machine room and placed at some other occupation.

Commencing a Day's Work.—In commencing work for the day, first look after each roller, and see that it is clean, in good order, and properly put in the machine. See that the machine and the countershaft are properly oiled, and have all drippings of oil carefully wiped up.

See that the driving belt is just tight enough ; yet not too tight. If the machine have tapes, these should be examined, to see that they are also tight.

Should you not have finished working off the forme the previous night, there will be many matters to look to. If the forme is a stereo one, examine that the plates are right—whether they are clean and fast on the blocks. If the forme is movable, see that the quoins are not slack. Then attend to any picks, and remove them by the use of the pick-brush. Next see that your outer cylinder sheet is clean and taut ; if not, replace it by another.

Finally, make a general survey of the machine. See that all bolts and screws are fast. Pay special attention to the condition of the ink-duct. Remove all tools, quoins, etc., that are not needed, and put them in their proper places. Remember that the so-called “accidents” of broken tapes and slipped plates rarely happen to the machine-minder who pays close attention to his business.

All work that is necessary for keeping paper, machine, or rollers in good order for the next day's work ought invariably to be done at night. Under no circumstances should such work be postponed until the morning. Employers ought not to grumble, even if overtime is occasionally necessary in strictly carrying out this golden rule.

During Work.—Fasten up every forme on the bed, so that it cannot be moved by the action of the rollers or that of the cylinder. The slightest movement will neutralise all work done in overlaying. Take great care in getting the first impression, for accidents often happen through thoughtlessness at the first starting of the machine. If the impression is too hard, it is almost sure to injure the forme. It is better to be on the safe side, and have too little impression at first ; for it can be proportioned afterwards, by adding more sheets of paper to the cylinder.

Never let your cylinder bearers or roller-lifts get much

worn; when they get below their proper height, replace them with new ones. Never pack the cylinder bearers.

A gauge for the height of the bearers is a new shilling placed on end. When the bearers are properly regulated to the cylinder, the workman may have confidence in placing as many sheets on the latter as may be necessary.

As a rule, never alter the impression screws of your machine. When once your cylinder is even, and fairly down on its bearers, leave them alone, unless compelled to readjust them. If they are screwed down too tight, you may deflect the type-bed, or elevate the cylinder and cause slurs.

The same remark applies also to the screws in the ink-duct. When the colour is once set, the machine-minder should endeavour to leave it alone as much as possible. If a roller does not supply the type sufficiently, it is of little use opening the duct. The more judicious plan would be to change the roller for one better adapted for the work in hand.

If there is a light place, such as a blank page, in a forme, some persons screw up the knife until it "cleans" or brightens the duct-roller in that part. This practice tends to ruin the duct, and probably to spoil the work; for the tighter one end is screwed up, the looser the other is, and the greater the amount of ink given out.

In using the ductor screws, great care should be taken not to put too much colour on at a time. Ink should then be thoroughly distributed before the inkers are put on.

It is customary to use one roller during the process of making ready for fine machine work; while the rollers intended for printing are put up when the proof is pronounced correct, and the machine-minder is ready to proceed with the printing of the forme. The reason of this practice is that the rollers are liable to get out of order during the time occupied in making ready.

It is a good plan to have formes down an hour or two before they are required to be laid on the machine, and then to give them a good brush over either with lye and water or turpentine, the latter always if there are wood-mounted blocks or if there are zinc blocks (for lye injures these badly). The ink used in pulling proofs usually clings to them, and the slight washing given by the proof-puller is not often sufficient to remove this. Sometimes certain of the letters, such as o, e, s, and w, are completely filled up with picks; these should be removed before the forme is laid on the bed.

Never wash or brush over a forme when it is on the machine, if you can clean it before laying it on.

If you have barely time to wash a forme before laying it on, but would prefer doing it, rinse it with a pailful of scalding hot water, which will loosen the dirt easily, and the heat will dry the forme in much less time than if you used cold water.

When it is absolutely necessary to wash a forme on the machine (*e.g.*, when a roller has burst,¹ or after very long numbers have been worked), it is a good plan to wipe the whole of it out, after using lye or turps, with a clean cloth wrung out in hot water.

Torn or stained sheets met with in the course of the work should always be thrown out. Creases and wrinkles frequently appear in the sheets when the paper has been carelessly wetted. These imperfections should be carefully removed by smoothing them out with the backs of the nails of the right hand.

Remember to look frequently at sheets of the job you are working, not only to see if the colour and impression keep right, but to be sure that no types have been drawn out by

¹ When a roller bursts and spreads over the type, a sheet of paper laid on the latter, and gently rubbed with the hand, will on its being carefully lifted, bring away much of the composition.

the rollers, and no spaces or leads have come up and are being inked. Should you observe anything of this kind amiss, stop the machine and put it right. If necessary, send for the compositor. It is inexcusable on the part of a machine-minder to allow hundreds of sheets to be worked off with such imperfections.

Washing-up.—On leaving off work of an evening, if your forme has still to remain on the machine, wash it over carefully with turps. Take out your rollers, wash them up, and put them carefully away. Wash up your ink table, and see that your ductor is covered so that no dust can get to it. If you are engaged on very fine work, wash out the duct.

If you are engaged on common work, you may omit the washing of the rollers.

When the job is worked off, the forme must be lifted, and brushed over at once with lye, and well rinsed with clean water. Formes have often to stand aside for two or three days, and if they are not washed the ink on them will in that time have become hard, and much dust will have collected.

The Keeping of Overlays.—Where blocks which have been worked from are likely to be used again, the overlays should be preserved. They should be carefully removed from the cylinder, and kept between the leaves of an old account book or other volume, so that they may be retained flat. Where much illustrated work is done, they should be placed in numbered envelopes, a record being kept in a book used for that purpose.

Requisitions for Paper, etc.—The machine-minder ought to give timely notice to the machine overseer or the store-keeper that he will need paper, ink, rollers, blankets, etc. He must not expect to be excused for the stopping of the machine for want of supplies when he has not given such notice.

Method in Working.—Before beginning work on a forme it is advisable that the machine minder should have in

writing a statement of the number of copies wanted, and of the time when the printed sheets are to be delivered to the warehouse. If he does not clearly understand the order, or is in doubt as to ink, paper, etc., he must apply for explicit instructions. He must *know*, not guess, exactly what he has to do.

If the time allowed for the work seems too short, the overseer should be consulted with the view of getting assistance if it can be obtained.

Keeping Count of Paper.—When periodicals or long editions are in hand, the machine minder should get a memorandum from the overseer stating the quantity of paper to be worked. On this memorandum the minder should make a daily record of the paper received and delivered. As this record is for the purpose of keeping account of the paper, and not of time spent on the job, or of tokens worked, the entries of receipts and deliveries should be in reams and sheets.

On the memorandum should be put down daily a statement of the spoilage. The number of reams worked off should be added up daily, and this product compared with the order slip, so that the minder can tell whether he is making or losing time.

Before lifting his forme the minder must actually know—not estimate—that he has printed the full number of copies ordered, with a proper number of extra copies as allowance for the waste that will be made in the warehouse and by the bookbinders. If the count is proved to be short after the forme has been lifted, the excuse of the minder that he has printed all the paper given to him ought not to be accepted.

Cleanliness.—All who handle paper must take every precaution to prevent marking it with soiled or sweating fingers. As this fault is even more objectionable than bad machine work, minders should closely look after the

fingers of layers-on, and throw out all soiled sheets. Those who cut up and pack printed work should be charged with the same duty. It should be remembered that the putting in of one soiled sheet in a book will spoil that book for sale. In order to prevent handling of paper as much as possible, and the smearing which sometimes occurs when the sheets are knocked up before the ink is dry, delivery is now taken from the flyers into trays in all the best work, as previously stated, and these are carried away when full and replaced by others.

General Duties and Responsibilities.—The machine-minder is, in all well-managed offices, responsible for the safety of the machine in his care. If it is out of order beyond his power to correct, or if any part is wearing badly and liable to break, he must at once notify the overseer of the fact. It is the minder's duty, and not the overseer's, to watch for the earliest indication of wear.

The minder is also largely responsible for the wear of his rollers, and for the prevention of any needless waste of paper or ink. He ought not to allow layers-on to neglect or maltreat the property in his charge. If he fails to report mischief which he could prevent, he should be regarded as making himself a party to the mischief.

He should also be held responsible for the quality of the machine work, for it must be supposed that he knows what good work is. He is engaged to do good work. If, for any reason, he cannot do it, he should stop and get advice or help. Under no circumstances ought he to be excused for going on with bad work. He should be held accountable for all loss or damage caused by his negligence or recklessness.¹

¹ We speak here of moral responsibility; the subject of legal responsibility is partly distinct from these considerations. A faithful employee will regard the former and leave the latter to take care of itself.

The minder is the immediate master of his laying-on boy, and he ought to take care that the boy is always well employed. When he has nothing better to do, let him be set to clean and brighten the machine, or clear off torn and waste paper. He should never be allowed to idle, if it can be prevented.

CHAPTER LXXIII.

THE MANAGEMENT OF PERFECTING AND NEWSPAPER ROTARY MACHINES.—Taping a Large Cylinder Perfecting Machine—Taping an Anglo-French—Working Perfecting Machines—Working a Newspaper Rotary Machine.

Perfecting Machines are seldom met with except in printing offices where much bookwork or weekly newspaper work is done. As regards newspapers, it is found economical to use them when the edition is under 30,000 and there is other work for the machines during the earlier part of the week: otherwise they are best printed on two-feeders, if the circulation be too great for the ordinary single-side machines, and too small for the special newspaper rotaries. As regards book printing, perfecting machines are decidedly economical if they can be kept well employed; but as they cost several hundred pounds apiece, and occupy much space, it does not pay to have them often idle.

The working of perfecting machines is always entrusted to an experienced machine manager, for there are many appliances in them which are not to be found in a single-side machine, and to this extent at least they are more complicated than the latter. In most of them the sheets are guided by a long and complicated system of tapes, and the presence of these makes it much more difficult to get them into working order and to keep them so.

There is a difference of working between the large cylinder machines with tapes and the Anglo-French small cylinder gripper machines.

Large Cylinder Perfecting Machines.—Taking the large cylinder machine, worked with tapes, the various operations in making it ready are as follows:—

Putting on the Calico.—The calico should be stretched lightly round the two cylinders, care being taken to avoid creases and to prevent its slipping. The two ends are stitched together, and the next thing to be done is to put on the calico. In many of these machines the two small cylinder bars have holes perforated in them, and the calico may be sewn on by bringing the needle and thread through these holes. One bar is flat, with two holes drilled in it, and there are two small studs inside the cylinder, and the bar is placed on to these. The other end bar is half round, and fits on to a round rod. The end of the calico being drawn through, is tightened with a ratchet wheel. But there are different methods in every make of the machine, and instruction as to each is given by the makers. Creases on the calico may be removed by loosening the ratchet wheel and straining the calico *from side to side*, across the cylinder.

*Putting on the Blanket.*¹—For good bookwork the blanket should be a thin one, for newswork it may be a medium or thick. Double over one end of it and sew it, forming a loop. Then place the iron bar through it, and fasten the bar to the studs of the calico bar. The other end of the blanket, if not carried right round the cylinder, must be pinned to the calico. While the pinning is being done the blanket must be well strained (to make it tight), otherwise the edges of it will cause slurs in working; care, too, must be taken that the pins do not come in line with the tapes, as these will sometimes pull the pins out and batter the forme.

Running in the Tapes.—This is an operation of some

¹ In doing the best work the blanket is dispensed with, and the cylinder is packed only with sheets of paper,

nicety, and reference should be made to the diagram on page 729. For the outer forme, the reel of tape is placed on the laying-on board. One end is then inserted so as to go partly round the drum under the drop-bar, in the direction of the travel of the machine; then carried through the machine in the following order: 1, round the inner forme cylinder; 2, over the first large drum; 3, under the second or registering drum; 4, over and under the outer cylinder; 5, round the wooden or iron spindle in the taking-off space; 6, under the two tape-bars below the outer printing cylinder, backward over the tape-bars or guides to the point of starting. The junction of the two ends must be made near the feeding-board, and they must be neatly sewn together *through* the width of the tapes. It will not do to sew them at the sides only, for as they travel over the wheels the friction will rub the sewing away and the tapes will come undone while working. Before sewing, stretch the tape as much as possible. This is very important, for otherwise the tape will stretch in working, and wander on to the forme. When one tape is put in the others may be carried through the machine by pinning one after another to the end of the fixed tape, and giving the machine a complete revolution, which is obtained by running it three times. Each of these tapes must be joined the same way as the first tape. A sufficient quantity of outer tapes having been supplied,

Put in the Inner Tapes.—Begin from under the laying-on board; pin the first tape to the *under* side of one of the outer tapes, run the machine steadily until the tape arrives at the wooden or iron spindle near the taking-off board; unpin and pass the tape under and over the guides below the registering drum, under the two tape-bars, below the inner forme printing cylinder, and under the guide below the feed-board, joining it to the first end by sewing in the manner before directed. For the second tape, pin it on to the one already in at the laying-on board as before, and, with

the inner forme table out, run the machine three times, to get a complete revolution. The pin will then be upon the inner cylinder; bring the reel of tape under the laying-on board to tape the reel-bar, unpinning the other end, and join over the reel-bar.

Set the tapes so as to take in the sheet, according to its size. The centre tapes should always remain in the centre of the machine; fold your sheet of paper into sections, according to the margins, and shift the other tapes till they fall where the margins of the printed sheets will be; the inner tapes must, of course, fall exactly under the outer tapes, and this can be provided for by altering the guides under the laying-on board and under the registering drum. These tapes are set while the machine is running.

Now lay down the inner forme on the centre of the coffin, and so that the tapes fall on the furniture of the heads or gutters, not over the type. Fasten the inner forme. When fastened, run a sheet through on to the outer cylinder. The impression will then show whether the inner forme is placed properly, so that the tapes run exactly on the margins. If it is not, the forme must be shifted. When right, put on the outer forme, running the machine gently to ensure the tapes being in their proper position. This can easily be seen by the register of the sheet just run out. Get the register right—this can be regulated by placing the outer forme at the same distance from its end of the coffin as the inner forme is from its end. If there is still a variation, this can be regulated by shifting the register drum up or down. Having got register, make ready your forme in the usual way; afterwards put on the rollers, and commence working off.

Various Hints.—The various machines have different duct movements. In some the arrangements are the same as in the Wharfedales. In others there are wheels on the ends of the ductor rollers, which wheels are worked by gut bands;

these are carried to similar wheels on the shaft of each impression cylinder—in this way the ductors are made to revolve; the supply of ink is regulated by placing the band round the large groove on the cylinder shaft, and the smaller one on the ductor if more ink is required.

When a tape breaks it is always best to clear it out of the machine and put in a fresh one according to the method already described; but if the formes are on it must follow the sheet within say six inches, the machine running the while, care being taken that the tape does not cross the impression.

The tapes must run freely, but not too loose. They must be guided exactly between the gutters of the forme. If a tape shows symptoms of “wandering,” it must be immediately tightened, or damage may ensue.

The regulation of the impression should be done by the packing of the cylinder and not by using the impression screws. Should these, however, have to be adjusted in order to lighten the impression, loosen the top one and tighten the bottom; to increase the impression, reverse the process. Care should be taken to keep these screws perfectly tight, or else there will be play in the bearings, which will cause a slur, injury to the overlays, or other mishaps.

The oiling of these machines must be especially attended to. This is even more important in regard to two-cylinder than one-cylinder machines.

Anglo-French Machines. — The arrangements of the Anglo-French Machine are as follows: There are four sets of tapes, and they are used for these purposes: (1) For carrying the sheet over the inner forme; (2) for carrying it over the outer forme; (3) for delivering the sheet; (4) for carrying the set-off sheets.

The *inner forme tapes* are carried first of all over a wooden roller near the inner cylinder. These are then brought under and close to the cylinder itself, round the tape-bar

between the cylinders, returning under the tape-bar, and each is joined to its beginning. The tightening of the tapes is regulated by a spring under the wooden roller.

The *outer forme tapes* are brought round the small wooden drum, between the two cylinders, under the outer end cylinder, over the wooden roller, outside the iron bar, over the tape reel-bars, and joined at the point on the drum where they started. The tightening is regulated by a balance weight or a spring on the iron bar.

The *delivery tapes* are put half round the wooden roller, close to and under the outer cylinder, half round and returning under the bar between the cylinders, also under the bar in front of the outer cylinder. They join at the wooden cylinder at the point where they started.

The *set-off tapes* are short tapes which are put over the tape reels near the laying-on board. They then pass over the iron bar in front. They return round the tape-bar between the upper bars of the cylinders, and join at the point where they started.

The setting of the tapes is done in the same way as in the large drum machines.

The Grippers.—There are eight of these on the outer cylinder, and six on the inner cylinder. But all may not be required in use; in fact, the fewer there are used in bookwork the better; for heavy work, however, all should be employed. The unused grippers must be perfectly secured on the bar by their screws, or an accident will occur. The grippers in use must be very carefully set so that they bite the paper on the margins. Although the two *sets* of grippers must face each other, the individual grippers must not be exactly opposite one another, or in the same line, but just far enough away to allow clearance, for should they meet much damage would ensue. The setting of the grippers is done by shifting those on the *inner* cylinder first. Move two so as to catch the two ends of the sheet. Place the

remainder an equal distance apart. They must not be in a line with the tapes, as they must open and shut quite free of the latter. The outer cylinder grippers must next be placed in position. There must be two grippers for the ends of the sheet, but they must be within two inches of the other or inner grippers. The remaining grippers are placed at an equal distance from each other, but clear of the inner grippers, or they will come into collision in opening and cause a smash.

The inner forme should be placed on the coffin in a position regulated by the margin there is to be on the paper. This can be ascertained by pulling a sheet. If you have no gauges supplied to you, and have to find out the place experimentally, be careful not to put the forme too close in, or the grippers may batter it. Allowance of space for the grippers is highly important in perfecting machines. The inner forme having been adjusted, the outer forme must be put on, about the same distance from the ink table. Secure both formes carefully.

Making register is done as in the large cylinder machine, but as there is no register drum the formes must be moved on the coffin so as to back each other precisely.

The tapes are prevented from becoming loose and tight alternately by the rising and falling of the outer forme cylinder as follows: There is a tape-bar above the taking-off board, and this bar works loosely in its bearers. It is provided with short levers, and when the tapes are inclined to loosen, these weights raise the pulleys and tighten the tapes.

The Working of Perfecting Machines.—Before pulling the first impression on a gripper machine, be sure that the "pitch" is correct, or the forme may be battered. The pitch, of course, regulates the margin on the printed sheet. To get the forme—or rather the edge of the printing surface—the proper distance from the ink table, keep a gauge of

the space that is necessary to be left. Then measure the distance from the bearers to the edge of the forme, and place the latter in the centre of the coffin.

Take particular care that the furniture used to keep the forme in its place is perfectly secure and solid. Unless it be so, it may spring during the working of the machine, and a quoin or piece of furniture getting out of its place may cause a serious batter or breakage.

The inking for the first pull is best done with a hand roller. Then take an impression very slowly, to test both the position of the forme and the due amount of pressure of the cylinder.

Underlaying should be done with the utmost care, in order to get a perfectly level surface, and thus ensure an even impression and uniform inking. It is really more necessary than overlaying. For plate work more than two underlays should never be allowed. As little paste as possible should be used.

After getting the impression right, the vibrator must be cut; that is, if the run is to be a long one. Place a roller loosely in its socket, and pass it even along the ink table on to the forme. Mark it to show the width of the pages or plates, and lift it off the machine. Cut away the composition that covers the gutters and about half an inch beyond. If this is not accurately done, the ink will accumulate in a line on the table, and make the edges of the pages darker and thicker than the other portions. The composition should not be cut too deep, or the roller will be loosened on its stock. A sharp knife is the best to use for the purpose, and there should be a clean and sharp edge left. If small pieces become detached during the working they will cause picks. Should the number worked be short, it is best to divide the duct with lead or plaster of Paris stoppers, and not to cut the vibrator.

In the Anglo-French machine the waver nearest the forme

has a lift to prevent its touching, owing to the table being run so far out.

Care must be taken that the wheels on each end of the inking rollers, which run upon the roller bearers, are secure.

Working Newspaper Rotary Machines.—The machines most used for printing newspapers are the fast rotaries made by Hoe & Co., Foster & Sons, Marinoni, Victory Company, Northern Press Company, and others. Those who work them must have a general knowledge of pressmanship, but it is even more important that they should be good mechanical engineers. Fine printing is not expected of them, but the keeping of the machines in good order and the rapid restoring of anything which may go wrong are absolutely necessary; therefore the machine-manager must have an intimate knowledge of the nature and function of every wheel and rod in the highly-complicated piece of mechanism entrusted to his care. In the double, quadruple and octuple, machines now used the parts are very numerous, and the derangement of any may necessitate the stoppage of the whole machine. Great care must be taken that all parts are kept well lubricated, that no bearers or spindles get hot, that all tapes are kept in the best of order, and that the folding gear works with precision. Obviously the pressman will take advantage of the time when the newspaper is being composed to see to these things, and especially to adjust or replace any tapes which show the least sign of giving trouble. The machine must in fact be quite fit to work off its 10,000 to 80,000 copies per hour as soon as the plates are ready.

The plates, which form segments of a cylinder, come down from the foundry planed on the inside, so that they fit closely to the printing cylinder. They are fastened in their places by the clamps supplied for the purpose, and this is done with the greatest expedition. There is no

time to patch up the impression, but if any page should be a little weak the plate is unfastened and a piece of stout paper is glued under it in that part where it is wanted.

Each impression cylinder is usually covered with a sheet of rubber, and over it is an ordinary stout printer's blanket.

Thin ink is specially made for these machines, and care must be taken to see that the ducts are always well supplied.

The machine-manager must keep a sharp eye all over the machine while it is at work, and the moment anything goes wrong it must be stopped, for the speed is so enormous that in a second or two the accumulation of paper causes a serious choking. This has first to be cleared and then the necessary adjustment made, after which the web is gently run through till it is ascertained that all is right.

With evening papers, where time is even more precious than with morning papers, there is usually a space in one of the plates for "stop-press news," or "fudge," as it is often called in the printing office. This is printed from special type, which is inserted in a contrivance called a "fudge box," which is an adjunct to one of the type cylinders. The precise nature of the fudge box varies with the different machines, but as a rule it is a curved metal case, which will hold from twelve to twenty-four lines of type. This type has a very deep nick at the bottom, and into this nick a piece of brass rule with a bevel fits to prevent the type from coming out of the box while the machine is running. The type is inked with its own inking roller.

Paper for newspapers is usually worked damp. In some offices they have machines for unreeling, wetting, and reeling up again, but in most the paper comes in wetted and ready for use.

CHAPTER LXXIV.

PRINTING WITH COLOURED INKS.—Monochrome Work—Two-colour Work—Multi-colour Work—Dusting Colours—Bronzing Mixtures—Two-colour Machines.

IN the present chapter we shall deal only with ordinary letterpress work in coloured inks, reserving for the second volume a full dissertation on Colour and Colour Printing, which includes not only the working of coloured inks but the harmonious combinations of the same to form pictures.

In succeeding chapters we shall describe each pigment, its nature, properties, and use ; for our present purposes it will suffice to presume that whatever coloured ink is required is obtained ready-made from the ink-maker.

Monochrome Work.—Monochrome, or single-colour, work differs from printing in black only in the fact that scarcely any coloured ink works as freely as black ink does. Some colours, indeed, require great care and skill in their manipulation. This is easily explained. The pigment of black ink is an impalpable carbon powder ; the pigments of coloured inks are of very different natures—some are produced from earths, some from coal tar, some from vegetable substances, and some from minerals. Hence in many cases there is a tendency for the pigment to precipitate itself from the varnish and to clog the types and rollers ; in others a chemical action is set up between the ink pigment and the surface to which it is applied, which action destroys the brilliancy of the colour and often modifies it altogether ; other inks again, which work with

great freedom, are so affected by light that after a few days' exposure work printed with them fades away. It is therefore very desirable that a printer who essays the use of coloured inks should have at least some knowledge of their properties, that he may know how to manipulate them and may be able to decide whether this or that hue may safely be adopted for the work he has to execute.

Natures of some Coloured Inks.—Leaving descriptions of most colours to a subsequent occasion, we will here say a few words concerning three or four of the most usual. Much more will be found in later chapters.

Vermilion ink is made with sulphide of mercury, which is very heavy and difficult to work, as it has a tendency to leave the varnish. It requires well-seasoned, hard rollers. As it sets up chemical action with copper, and thus loses its brilliancy, it must not be used to print from the ordinary copper-faced electrotypes, but all blocks must be brass- or nickel-faced, or silvered over. It is obviously best to get the blocks properly faced at the electrotyper's, but for short runs they may be silvered over by the application of a little of a solution made of the following ingredients: Nitrate of silver 2 drachms, water 37 drachms, sal-ammoniac 1 drachm, hyposulphite of sodium 4 drachms, precipitated chalk 4 drachms. This should be thoroughly shaken before use, and applied with a brush or cloth, so as to cover all the printing surface, the electrotype having been first cleaned and dried.

The costlier red inks are always stiffer in the body than the cheaper kinds, and have a tough consistence. They also become heavily skinned over when laid aside for some time, besides becoming lumpy, hard, and dry. To prevent skinning in the tin, pour a thin layer of glycerine over the ink.

To remedy lumping and hardening, work the ink freely a few minutes with a strong knife, using a very little of No. 2 varnish as a softener. This will smooth away the lumps and restore the working quality of the ink. The remedy applies

equally well to all inks that become hard, lumpy, or gummy, and by means of it the contents of the can may be used to the last.

Lakes, carmine, rose pink, Prussian blue, and several yellows are fugitive, some of them very much so, and if the work is required to stand prolonged exposure to light they must not be employed. Fortunately they can generally be replaced by colours almost equally effective.

Ultramarine is extremely difficult to work, as it clogs badly; but the printer is not likely to be much troubled with it, for it is exceedingly expensive.

All ochres and other earth pigments have a disposition to work thickly; they should therefore generally be avoided when half-tone blocks or cuts with fine lines have to be printed.

It is a bad habit to thin out coloured inks with too much varnish with the object of making them work freely or go farther. It injures their colour and makes them pale and attenuated. Inks newly obtained from the ink-maker's should as a rule be used as he sends them in, even though the addition of varnish may avoid some washings up.

Half-tone Work in Colours.—Many colours are quite unsuitable for the printing of half-tone blocks, and it is pitiable to see them employed for it, as they often are by unskilful printers. As a rule these blocks look best in black, but beautiful pictures can be produced from them with rich browns, deep greens, and Indian red; light colours are almost always inappropriate; deep blue is occasionally effective. As before stated, only free-working inks are suitable for these blocks, and the colours should always be full and dry well.

Two-colour Work.—When a job has to be printed in two colours it is generally necessary that it should be worked from complementary formes made up as described in Chapter XXXIV. Here the pressman has not only to contend with the difficulties already mentioned, but he must produce per-

fect register or his work will be defective. Obviously he can do nothing well unless the formes are properly made up, and when he gets them from the composing room he should test them: should he find anything wrong he must point it out and send them back for correction.

He should always work to points, unless the formes are small and he can entirely rely on his lay guides, his grippers, and his layer-on. Even when he does use points he may find registering difficult for reasons mentioned later.

Choice of Colours.—The colours chosen must be such as harmonise or contrast well, and herein the artistic temperament of the printer shows itself. Tables of colours which harmonise and contrast with one another are given in a later chapter. In making choice of types the printer should have in his mind the colours in which they are to appear. It must be remembered that the effect on the eye is not the same with red or yellow or violet that it is with black or dark green. A job all in heavy-faced type would be too sombre for black alone, but a single line of red would lighten it up wonderfully. This fact allows the use of many of the heavy faces in bright inks when they would be totally inadmissible in black. Some colours are very faint naturally when put upon white paper, as, for instance, the various light yellows. If used, these should always be for subordinate lines. Principal lines should be in the intense colours, and these should never cover one quarter of the surface of the job. The emphasis is lost by too frequent repetition.

When coloured paper is used care must be taken that the colours of the inks chosen will form harmonies or contrasts with it, as well as with each other.

If solid ground-tint blocks of a light colour are used, words printed on them in a darker colour have the same effect as a two-colour line.

A shaded line—black and red for example—may easily be produced with ordinary types. If on a light blue ground

tint a line is printed in red and then printed from the same types in black, the lay being slightly to the left of the first lay, a black letter with a red shade on a light blue ground tint may be produced. Or if the same words, set in a character of a certain size, are first printed in a light colour, and then the same words, set in a smaller size of the same character, are printed over these in a deeper or different colour, there will be a light or ground colour to show up all round the type worked last. Each colour must be allowed time to dry, and quick-drying inks must be used.

By passing a sheet through the press twice and printing it a second time in the same place with the same coloured ink, deeper and more brilliant effects can be produced than can be obtained with one colour once applied. It is like giving a wall two coats of paint instead of one. Of course when this method is adopted the register must be perfect or the job will be spoiled.

Printing in Two Colours from one Forme.—It is very seldom this can be done, but there are occasions when it can be resorted to. One of these is where the job is an open poster. Here the forme is laid on the bed of a hand press and various lines are inked with the colours appropriate to them, each with its own roller. The large spaces between the lines permit of this being done by a careful man without one colour overlapping another.

So, too, when a very few copies of a page with one coloured initial in it are wanted, it is sometimes feasible to pursue this plan: After each impression loosen the forme, lift the initial out of it and replace it with quadrats, then roll the forme with black, ink the initial separately with its proper colour, drop it in its place in lieu of the quadrats (which have now to be taken out), tighten the forme again, and then take the impression. This is, however, a very slow process, and one to which resort can be made only in exceptional circumstances,

Printing in Three or more Colours.—However many the colours the method is the same: there are (except in the few cases just mentioned) as many formes and as many workings as there are colours. The more the hues, the greater, of course, the need for harmony or contrast and good taste; so, too, the greater will be the need for good register and the difficulty of obtaining it; for the forme expands and contracts according as the temperature is higher or lower, and the paper also contracts and expands according to the degree of humidity in the air. There is always some humidity in the atmosphere, and the ink itself draws a little. For these reasons a three-colour forme is more than half as hard again as a two-colour one to print, and each succeeding colour adds to the difficulty. It is easier to do the work from three stereotypes or electrotypes of a single forme, parts of each being cut away, than from three type-formes, as the justification then is perfect; but it must be noted that in a job of great accuracy the three casts or moulds should be taken at the same time, so as to make the plates as near as possible in perfect agreement with each other. This is more apt to be the case when made together than when one plate is made in the morning and one at night. Printing should be completed as soon as possible. On a wet morning in February a sheet of paper is not of the same size as on a dry day in August, and even the change of weather in a few hours may make all the difference between perfect and imperfect register.

Dusting Colours are used to give brighter effects than can always be obtained from inks. They are in powder. The paper is printed in an invisible or "white" varnish, or with ink of the same hue as that of the dusting colour, and the latter is dusted over it with a broad hair-brush, a clean hare's foot, or a little cotton wool. The colour adheres to the paper only where it is coated with varnish, and when the latter is well dried the superfluous powder is brushed off.

Bronzing Mixture.—A changeable hue may be given to inks with the following mixture: Gum shellac, $1\frac{1}{2}$ lb., dissolved in one gallon of 95 per cent. alcohol of Cologne spirits for twenty-four hours. Then add 14 ounces aniline red. Let it stand for a few hours longer, when it will be ready for use. When added to a good blue, black, or other dark ink it gives it a rich hue. The quantity used must be very carefully apportioned.

Two-colour Machines.—These, as stated on page 597, are machines which print in two colours at one operation. They have two tables, two sets of rollers, and two sets of apparatus for inking. The two formes are laid on the two beds, or coffins, in the machine, and each forme is rolled with its own colour by its own set of rollers. Usually the cylinder carries the sheet round twice before releasing it. The first time it gets impressed by the one forme and the second time by the other.

As in the case of other machines, the cylinder must be packed according to the nature of the work to be done; for high-class work use hard packing, for ordinary a calico, and for heavy news or poster work a blanket. The first forme is then laid on and locked up, and the second forme afterwards placed in position—each in its proper coffin. A sheet is pulled to ascertain whether the position is correct. The ink is got up by being put in the ducts, the distributing rollers in their forks, and a few sheets run through. The overlaying is afterwards done, and the machine is ready to begin work.

The least solid forme, or the one likely to give least trouble, should go on the first coffin, so as to print first. The ink should be used so that the sheet may not be torn in going through the machine. Always work with dry paper whenever practicable, but if necessity compels working with wet, the paper must not be too much dampened, or it will stretch, and prevent proper register being made.

CHAPTER LXXV.

BRONZE WORK.—Bronzes — Gold Size — Printing, Dusting, and Burnishing.

SOME work, notably Menu Cards, Ball Programmes, Invitation Notes, and Greeting Cards, is often executed, wholly or in part, in gold or silver, and of late in copper also. This is usually achieved with the aid of bronze powders; but, so far as gold is concerned, there are alternative methods, one by using gold leaf, and the other by using Dutch metal. The gold leaf process is only resorted to in very special work, while Dutch metal is used mainly in show-card work, where ordinary bronze powders are not considered sufficiently bright for the purpose.

Bronze Work.—Bronze powders are of two classes, patent bronze powders and hand-made bronzes. They are of gold, silver, copper, and certain of them exhibit colours like crimson, purple, and green. Gold bronzes are of various hues: pale deep, extra deep, and red gold. They are of various fineness, too, some being very fine, others coarser.

The prices of these powders vary according to the colours, ranging from 3s. 6d. to 50s. per lb. What goes the farthest is always the cheapest. Very smooth and fine powders have a tendency to blacken the paper unless it is enamelled. Such powders, too, are not as brilliant as the coarser qualities.

The differences of hue are caused by the powder being subjected to varying degrees of heat, and also by the

chemicals added. To some powders colouring matter is added, and if rubbed in the fingers the two will separate.

The points to be observed in selecting bronze powders are : Fineness, softness, chemical purity, and price, having regard to covering power.

The *silver bronzes* are of two kinds. One is made from real silver and the other from white metal. The latter is bright when printed, but soon turns black.

The mode of doing gold or other bronze work is this : The forme is printed with an adhesive varnish, or one of the special "gold preparations" sold for the purpose, and then, while the impression is still sticky, the bronze is dusted on, the surplus dusted off, and the adherent parts polished and sometimes burnished.

A rough-and-ready method of using bronze is to print with black ink and dust the powder on afterwards. This gives an unsatisfactory result, deadening the effect of the bronze. Printing with red ink is somewhat better, but should only be adopted as a make-shift.

Gold Size.—Very much depends on the "preparation," or "gold size" as it is often called. It is essential to good work that it be not only good but suitable, having regard to the tone and colouring of the bronze to be used.

Any adhesive varnish which may be used for gold printing is called *gold preparation*. It may consist of the adhesive medium, pure and simple, such as melted gum, or long varnish and gold size ; or this adhesive varnish may, for the purpose of increasing its strength, be modified by the addition of body colour, such as burnt umber, burnt sienna, or chrome. The primary qualification which a good gold preparation ought to possess should be a capacity for sticking. It should also work clean (the addition of the pigment sometimes seriously hinders clean impressions).

Most of the ink manufacturers now supply a special size for bronze printing which meets every requirement. To

those who want to make their own size may be recommended a recipe given by a writer in the *British Printer*: "Take equal parts of brown lake, light and chrome yellow, add to them about one-tenth their weight of middle tint varnish, and about one-twentieth of extra strong litho varnish; mix well together. This preparation does not fill in the fine lines of the type, but works free and clean, and will be found to answer well for most kinds of paper." If bronze will not stick when dry, a little mucilage or liquid gum may be put into the size and it will often prove efficacious. Mix only a little at a time, and wash up frequently the rollers and also the disc, if a jobbing platen machine is being used."

Some of the size supplied by ink-makers gives much trouble to printers. It dries on the rollers and the forme, and on the sheets before the bronze can be dusted on, and the poorest bronze has to be resorted to. It fills up the finer lines of engravings and shaded letters, giving a dirty muddy effect, as though too much ink had been used. This must inevitably result where such an extra-glutinous and quick-drying pigment is constantly thickening and hardening on the delicate hairlines, necessitating frequent stops and washings-up.

When this is the case, the following substitute is recommended by the *American Art Printer*: "Take three parts of lemon yellow ink and one part of No. 2 varnish and mix them well; add about one-twentieth of the above quantity of copal flock varnish and mix perfectly. This size will run all day without washing up, works freely on or off the rollers, and allows sheets to be longer without bronzing; and altogether cleaner and brighter work is produced, showing fully-covered instead of only half-bronzed lines. Slow to set, it gives the bronzer a better chance to cover his job, and for this reason holds more firmly and permanently every grain that is spread upon it. . ."

The paper used has much to do with the selection of the kind of preparation. One without body may be admirably suited for printing on hard papers, while for softer paper it will sometimes sink into the fabric like water in a porous stone, leaving after a while the bronze in a dry powder, which may be readily wiped from the surface of the sheet.

The object is to get a material which shall possess the necessary density and toughness, combined with adhesiveness—one that is too thick to soak into the paper, and yet has a drying property sufficient to fix the metal or the dust. Enamelled papers require very stiff varnish, ordinary hard papers or card will take a stiff varnish too; soft papers require a thin varnish, with some chrome or other body in it.

Silver work should have some flake white mixed with the varnish, with a sprinkling of milori blue.

In working with enamelled papers much difficulty is often experienced, as the strong varnish will sometimes make the surface of the paper to peel off. Should this happen, do not add thin varnish, but mix in lavender oil, a very little at first, and more as may be found necessary. Be careful not to use more of it than is requisite.

Working.—Having selected the preparation that is most suitable for the job in hand, choose good, well-seasoned rollers of the treacle and glue kind (these work the preparations better than the other kinds do), and slightly sponge them with water a minute or two before using them.

The preparation, which should be neither too thin nor too thick, should work freely, and cover the type with a close and even surface when rolled. Distribute it well, and use no more than is needed to cover evenly and hold the bronze. When too much of the preparation is used, rough and bad work will result, however thoroughly the bronze may be rubbed in.

When burnt sienna or umber is in the size, remember that they are pigments that dry up very rapidly, and soon

cause the rollers to lose their tackiness and freshness; hence frequent washing up is necessary.

The *impression* for bronze printing should be firm and flat, hence platen and cylinder should be hard packed. On treadle platen machines a card cover with four or five sheets of paper makes a good packing.

Dusting.—The impression having been taken, the sheet (or card) must forthwith be removed to receive the bronze. This may be applied with a brush, invented for the purpose; the back opens, and within is a cavity into which the bronze is placed, there are perforations on the brush side, and through these the bronze finds its way to the paper. When such a brush is not available, a piece of cotton wool, either made into a ball or wrapped in a piece of very soft wash-leather, may be used.

The bronze, being metal reduced to an impalpable powder, is very injurious to those who work long in it, and serious diseases will often result, unless all possible precautions are taken to prevent the operator from inhaling the atoms which are dispersed through the air. In order to avoid these consequences, it is well to use a frame about a yard square, with glass above and at the sides, so as to permit the workman to see his work. On the front face a longitudinal opening can be made, to allow of the introduction of the sheet of paper and the arms of the operator. A bandage can also be worn across the mouth; and with such precautions workmen have followed the employment for years without suffering the least inconvenience. They should, however, drink copiously of milk.

A zinc or wooden tray in which to lay the sheets successively is a useful arrangement. The smoother the bottom, the more readily and completely the surplus bronze can be wiped up. A sheet of enamelled cardboard may be fastened to the bottom of a wooden tray; or, what is better, a sheet of glass of the proper dimensions.

Assuming the instrument used to be the cotton-wool ball, it is dipped in the bronze, any superfluous powder that may adhere being shaken back. It is next applied to the work, gently going over all the printed portions until covered. A circular motion is best for ordinary work, but rule borders and the like should be rubbed along their lines and not across them. It will be known when all is covered by the cotton pad slipping along more easily. Then increase the pressure and briskness of motion in rubbing over the work for a few seconds, as if polishing. In this way brilliant and even work may be obtained. The lively rubbing makes a great difference in the result.

Bronze powder is sometimes put on with too great pressure, which causes unsightly marks on the paper or card. Some of the badly compounded bronzes, with apparently a good colour, produce a like result, however carefully they may be applied. Such qualities should be cast aside, as they will become tarnished in a short time.

In using bronze powder with a cotton pad, too much of it should not be taken up at a time, as an over quantity tends to disturb that portion which has adhered to the printed part of the work, leaving an unpolished surface, as well as causing a large waste of bronze. The fingers should not be allowed to touch the printed parts before or after bronzing. Too much of the work should not be allowed to remain piled up, nor any of it be put in a damp place, or the bronze will be tarnished.

To maintain the brilliancy of a job, fresh cotton pads should be used from time to time, as continual use of any of them gathers dampness and dirt, which are detrimental. Occasionally wiping over the forme with a rag damped with benzine will assist in keeping up the brilliancy.

When the impression is properly dusted, the superfluous bronze must be wiped off. This may be done either with cotton wool, which is rather wasteful, or with wool wrapped

in soft chamois leather or kid. Finally, the remaining bronze may be wiped off with an old silk handkerchief.

It is essential to good work that the sheet be dusted with the bronze as soon as it is printed; therefore two or more bronzers should be put on to keep pace with the machine, or the speed of the latter should be kept down by double rolling, throw-off motion, etc.

Burnishing.—All bronze work is greatly improved by being burnished in some way. After being well dried, the printed sheets or cards may be passed through a rolling mill of some kind, or pressed between polished zinc plates.

It is sometimes effective to pass the bronzed sheets through the press, printing them again in perfect register, but without inking the forme; the impression thus given by the types will have the effect of solidifying and burnishing the bronze.

Several excellently designed *bronzing machines* have been introduced to the trade during the last few years, and are found to be very desirable acquisitions to a printing office, not only because they obviate the dangers and inconveniences of using loose bronze, but from the fact that they secure a considerable economy in the consumption of the material, and do the work at a higher speed than can be reached by hand. The bronze is contained in a receptacle something like the ink-duct of a printing machine, and is conveyed over the sheet by rollers covered with plush or felt. The sheet is placed on a traversing band, and carried into the machine between the rollers, and discharged at the other end. The criterion of a machine of the kind is the completeness with which it works the gold into the impression.

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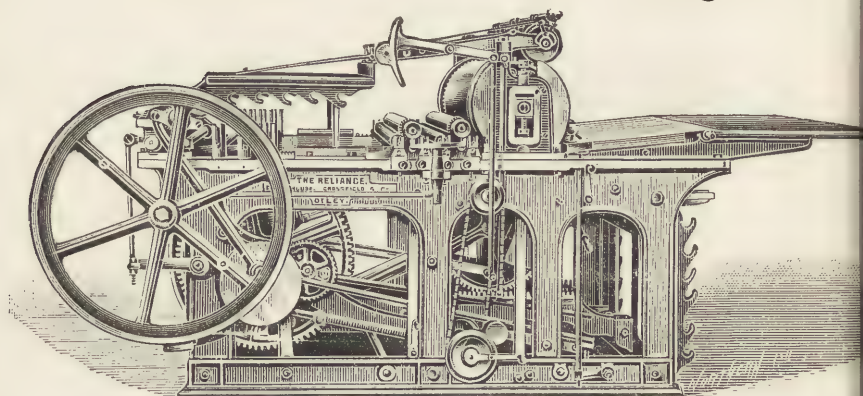
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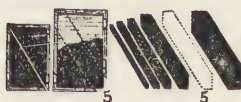
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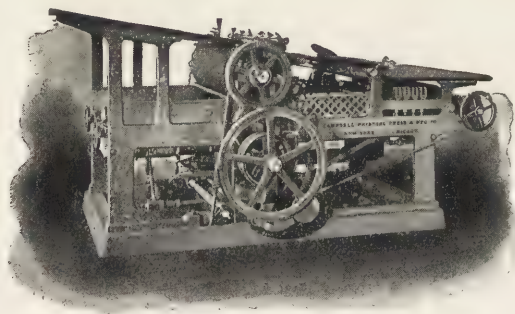
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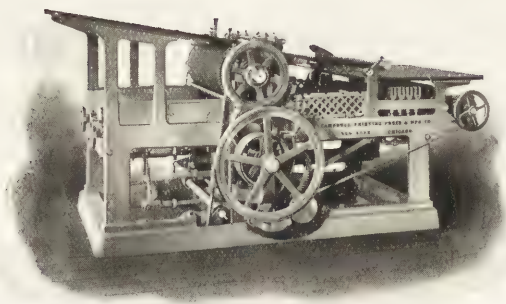
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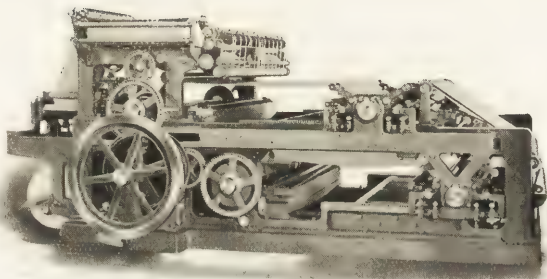
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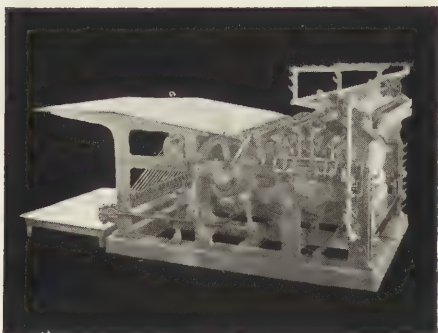
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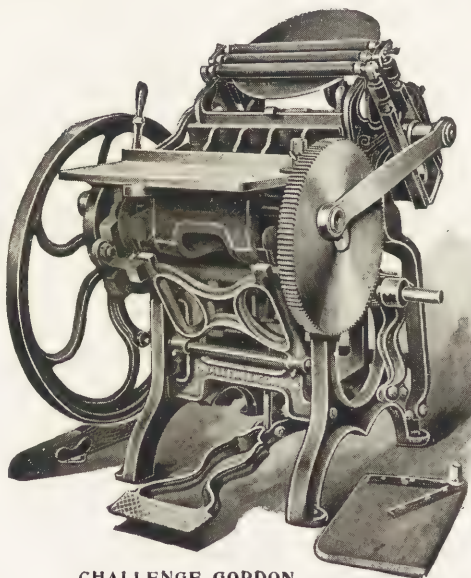
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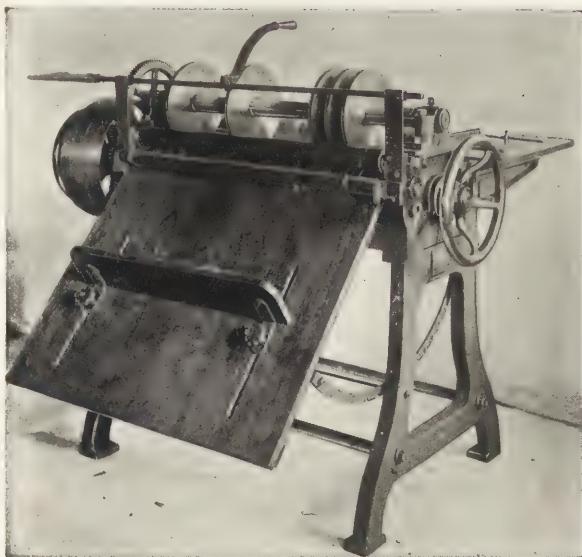
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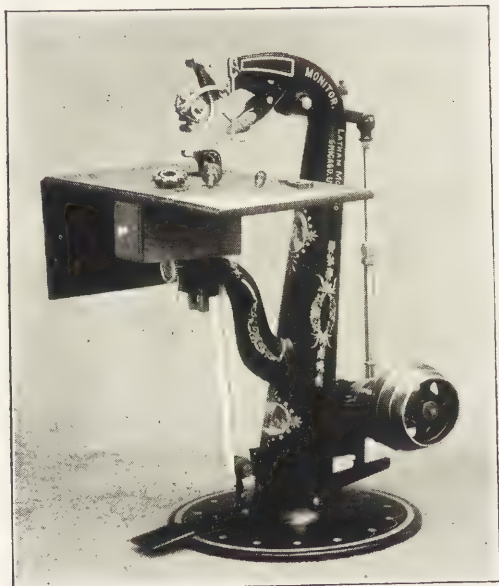
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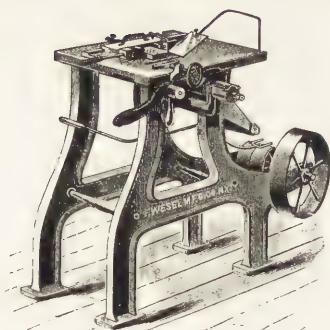
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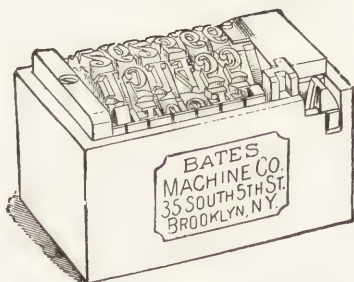
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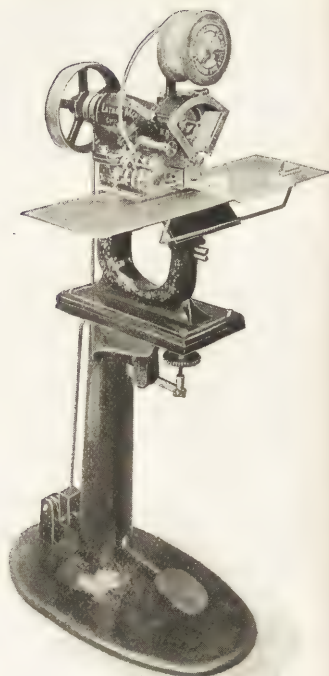


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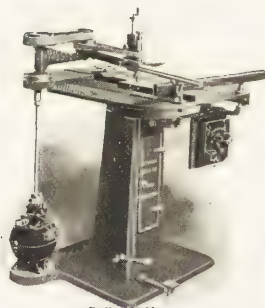


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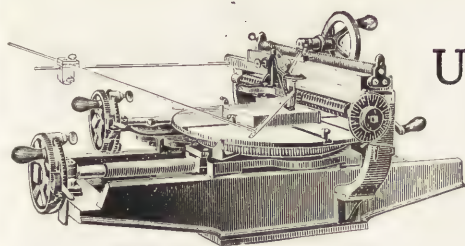


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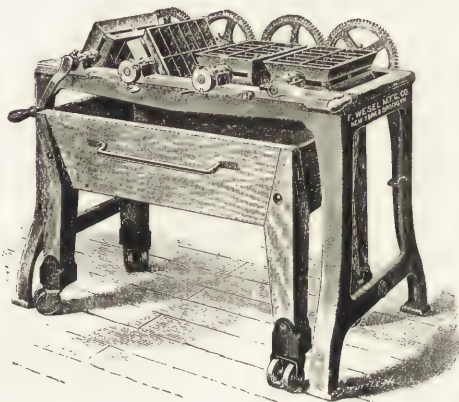
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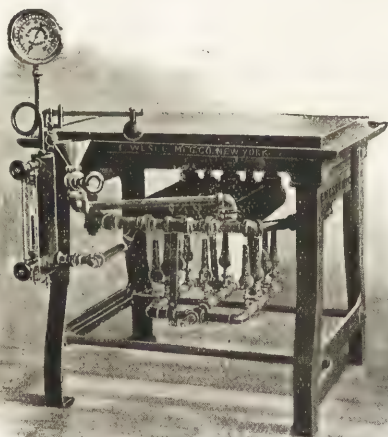
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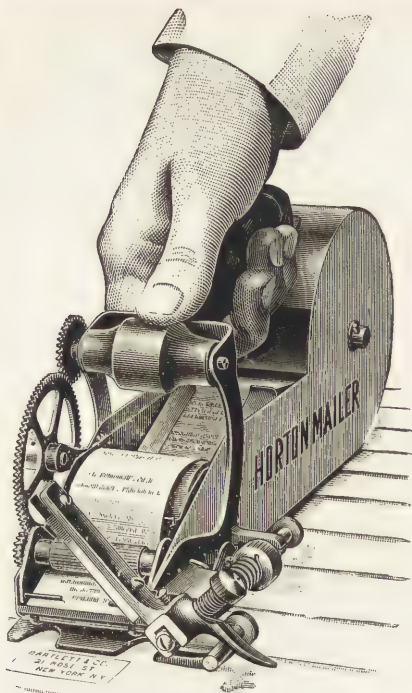


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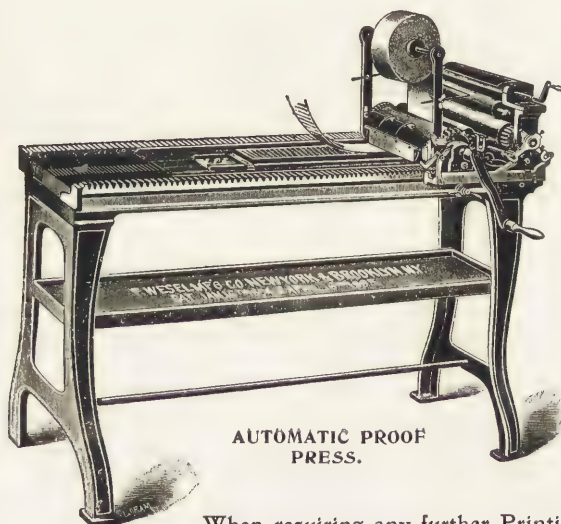
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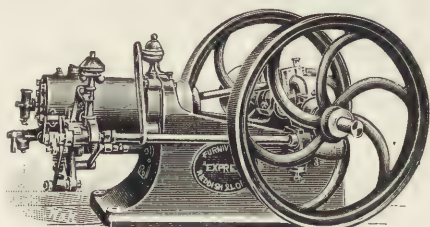
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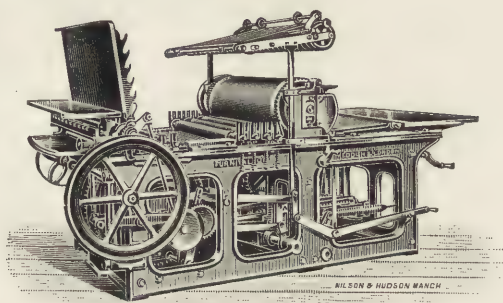
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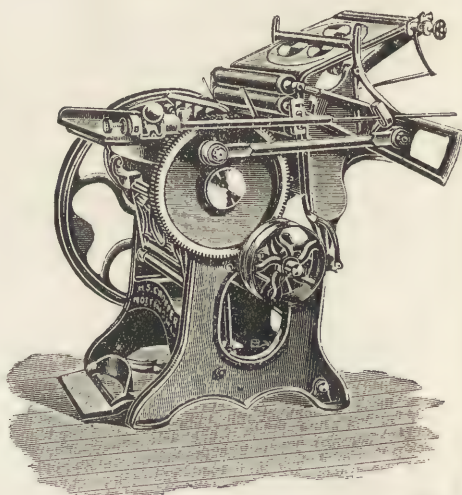
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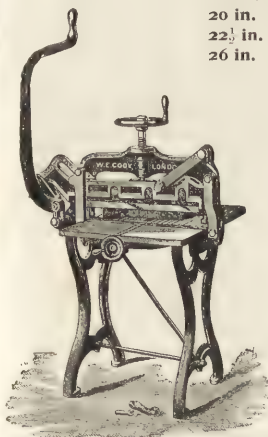
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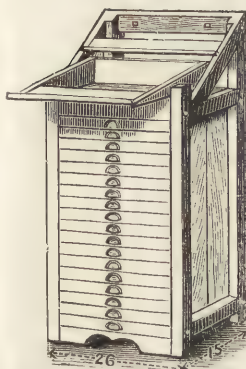
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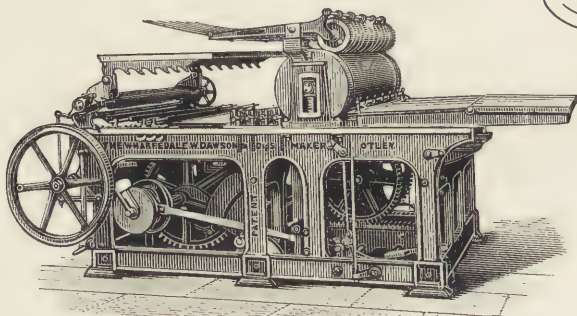
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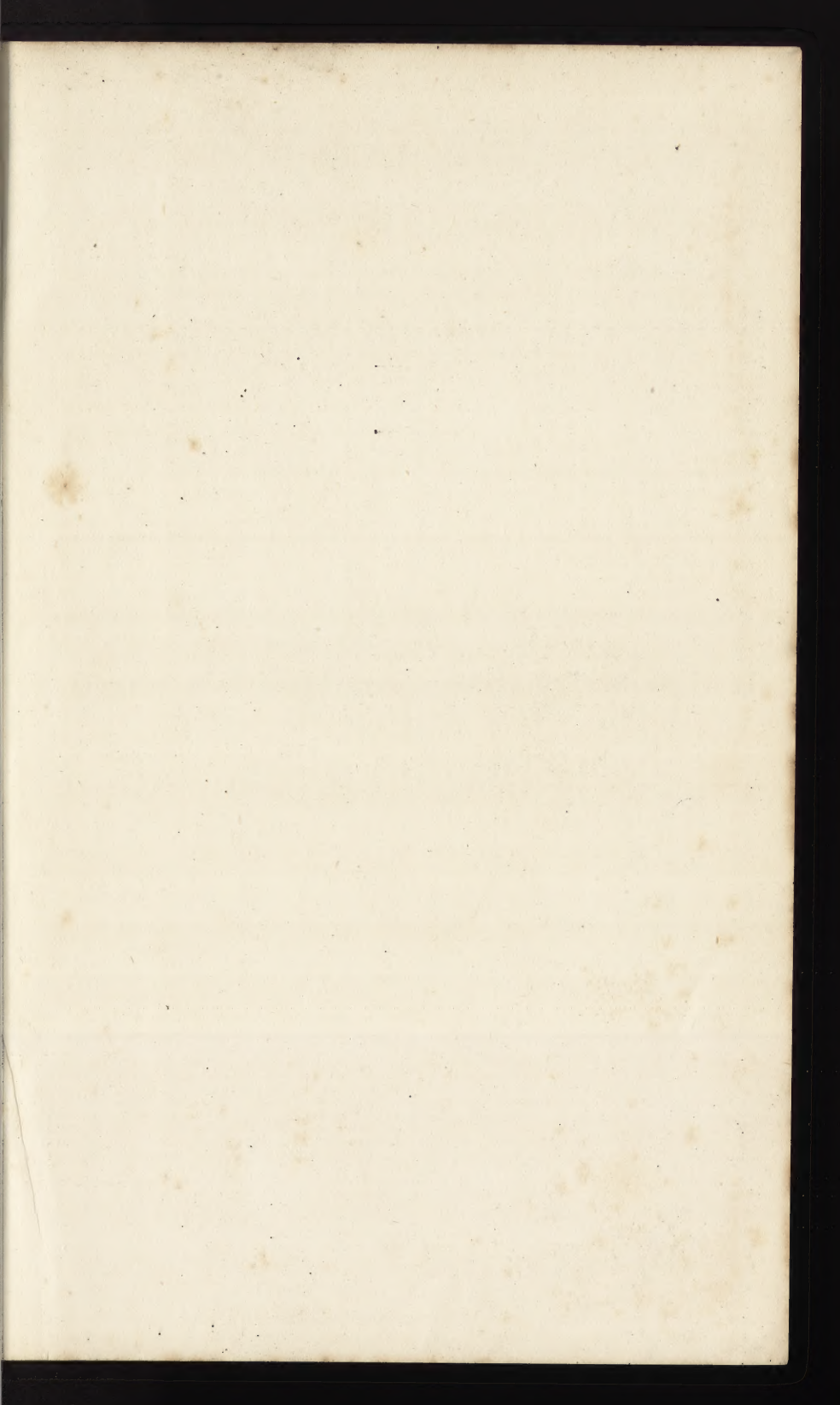
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